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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/625,382	07/23/2003	Aman Safaei	W1200-00040	9509

7590 06/30/2005

DUANE MORRIS LLP
One Liberty Place
Philadelphia, PA 19103-7396

EXAMINER	
NGUYEN, KIMBERLY D	
ART UNIT	**PAPER NUMBER**
2876	

DATE MAILED: 06/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

RECEIVED
OIPE/IAP
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NEW CENTRAL FAX NUMBER

Effective July 15, 2005

On July 15, 2005, the Central FAX Number will change to **571-273-8300**. This new Central FAX Number is the result of relocating the Central FAX server to the Office's Alexandria, Virginia campus.

Most facsimile-transmitted patent application related correspondence is required to be sent to the Central FAX Number. To give customers time to adjust to the new Central FAX Number, faxes sent to the old number (703-872-9306) will be routed to the new number until September 15, 2005. After September 15, 2005, the old number will no longer be in service and **571-273-8300** will be the only facsimile number recognized for "centralized delivery".

CENTRALIZED DELIVERY POLICY: For patent related correspondence, hand carry deliveries must be made to the Customer Service Window (now located at the Randolph Building, 401 Dulany Street, Alexandria, VA 22314), and facsimile transmissions must be sent to the Central FAX number, unless an exception applies. For example, if the examiner has rejected claims in a regular U.S. patent application, and the reply to the examiner's Office action is desired to be transmitted by facsimile rather than mailed, the reply must be sent to the Central FAX Number.

Office Action Summary	Application No. 10/625,382	Applicant(s) SAFAEI ET AL.	
	Examiner Kimberly D. Nguyen	Art Unit 2876	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☐ This action is non-final.

3)☒ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-13,19,20,22-26 and 28-39* is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☒ Claim(s) *4-8,21 and 27* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/18/04,12/7/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This application is in condition for allowance except for the following formal matters:

Claim Objections

2. Claims 14, 27 are objected to because of the following informalities:

Re claim 14, step b): "the new game" lacks of antecedent basis and should be substituted with "a new game".

Re claim 27, line 2: "the new game" lacks of antecedent basis and should be substituted with "a new game".

Appropriate correction is required.

Prosecution on the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

A shortened statutory period for reply to this action is set to expire **TWO MONTHS** from the mailing date of this letter.

Allowable Subject Matter

3. Claims 1-13, 19-20, 22-26 and 28-39 are allowed.

4. The following is an examiner's statement of reasons for allowance:

Re claims 1-10, 19, 22-26, 28-29 and 37: The prior art of record fails to teach or fairly suggest a computer implement method for processing lottery sales data, including the steps of causing display of a table on a computer, the table containing data representing lottery game attributes and lottery ticket sales for a plurality of lottery game types; enabling a user of the computer to query the data in the table based on at least one criterion from a predetermined list

of criteria; and forecasting sales of a new lottery game based on results of the query as set forth in the instant claim.

Re claims 11-13, 20, 30-32 and 38: The prior art of record fails to teach or fairly suggest a computer implemented method for processing lottery sales data, including the steps of causing display of a table on a computer, the table containing data representing lottery game attributes and lottery ticket sales for a plurality of lottery game types; enabling a user of the computer to query the data in the table based on at least one criterion from a predetermined list of criteria; and modifying the table to contain values of an index that compares performance of each of the lottery game types that satisfy the query.

Re claims 33-36 and 39: The prior art of record fails to teach or fairly suggest causing display of a table on a computer, the table containing data representing lottery game attributes and lottery ticket sales for a plurality of lottery game types; causing the computer to display a menu for configuring the new game; configuring the new game using game attributes input into the menu by the user; and automatically generating and graphically displaying a schedule for development and launch of the new lottery game.

5. Claims 14-18, 21 and 27 would be allowable if rewritten or amended to overcome the objection(s) as set forth in the instant Office action.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimberly D. Nguyen whose telephone number is 571-272-2402. The examiner can normally be reached on Monday-Friday 7:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael G. Lee can be reached on 571-272-2398. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KDN
June 24, 2005

MICHAEL G. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

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PTO/SB/08A (04-03)
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	10/625,382
Filing Date	July 23, 2003
First Named Inventor	Aman Safaei
Art Unit	~~NOT YET ASSIGNED~~ 2876
Examiner Name	~~NOT YET ASSIGNED~~ K. NGUYEN
Attorney Docket Number	W1200-00040US

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
KN		US- 5,223,698 A	06-29-1993	Kapur	
		US- 5,324,035 A	06-28-1994	Morris et al.	
		US- 5,403,999 A	04-04-1995	Entenmann et al.	
		US- 6,210,276 B1	04-03-2001	Mullins	
		US- 6,277,026 B1	08-21-2001	Archer	
KN		US- 6,616,531 B1	09-09-2003	Mullins	
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

Examiner Signature	Kevin Nguyen	Date Considered	6/15/05

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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Filed : 3/18/04

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Substitute for form 1449/PTO			Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT			**Application Number**	10/625,382
			Filing Date	July 23, 2003
			First Named Inventor	Aman Safaei
(Use as many sheets as necessary)			Art Unit	~~not yet assigned~~ 2876
			Examiner Name	~~not yet assigned~~ K. NGUYEN
Sheet	2	of 2	Attorney Docket Number	W1200-00040US

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
KN		International Search Report for International Application No. PCT/US03/23042, dated January 13, 2004	

Examiner Signature	Kim Nguyen	Date Considered	6/15/05

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 120 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

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PTO/SB/08A (10-01)
Approved for use through 10/31/2002. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Substitute for form 1449A/PTO	Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT	**Application Number**	10/625,382
	Filing Date	July 23, 2003
(use as many sheets as necessary)	**First Named Inventor**	Aman Safaei
	Art Unit	~~3622~~ 2876
	Examiner Name	~~Not Yet Assigned~~ K. NGUYEN
Sheet 1 of 1	Attorney Docket Number	W1200-00040

U.S. PATENT DOCUMENTS

Examiner Initials	Cite No.	Document Number Number-Kind Code (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
KN	A	US- 6,381,605	04/30/02	Kothuri et al.	
KN	B	US- 5,796,932	08/18/98	Fox et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials	Cite No.	Foreign Patent Document Country Code -Number - Kind Code (if known)	Publication Date MM-DD-YYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines Where Relevant Passages or Figures Appear	T

Examiner Signature	Kim Nguyen	Date Considered	6/14/05

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Filed 12/7/04

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Approved for use through 10/31/2002. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Substitute for form 1449B/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				**Application Number**	10/625,382
(use as many sheets as necessary)				**Filing Date**	July 23, 2003
				First Named Inventor	Aman Safaei
				Art Unit	~~3622~~ 2876
				Examiner Name	~~Not Yet Assigned~~ K. NGUYEN
Sheet	2	of	2	Attorney Docket Number	W1200-00040

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher city and/or country where published	T
KN	C	International Search Report dated November 30, 2004 for PCT Application No. PCT/US03/28408.	

Examiner Signature	[signature]	Date Considered	6/14/2005

*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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Notice of References Cited	Application/Control No. 10/625,382	Applicant(s)/Patent Under Reexamination SAFAEI ET AL.	
	Examiner Kimberly D. Nguyen	Art Unit 2876	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-5,197,736	03-1993	Backus et al.	273/142R
	B	US-5,118,109	06-1992	Gumina, Anthony	273/139
	C	US-6,267,670	07-2001	Walker et al.	463/17
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N	JP02001037954A	02-2001	Japan	Sasaki, Hiroyuki	
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Robin Peterson and Minjoon Jun, Forecasting sales in wholesale industry, Summer 1999, The Journal of Business Forecasting Methods & Systems.
	V	Carl Vreeland, The Jantzen method of short-range forecasting, April 1963, Journal of Marketing (pre-1986)
	W	Donald Bowersox et al, Simulated product sales forecasting a model for short-range forecasting and operational decision making, Copy right 1981 by JAI Press Inc., Research in Marketing, volume 4, pages 39-68.
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Forecasting sales in wholesale industry
Robin T Peterson; Minjoon Jun
The Journal of Business Forecasting Methods & Systems; Summer 1999; 18, 2; ABI/INFORM Global
pg. 15

FORECASTING SALES IN WHOLESALE INDUSTRY

By Robin T. Peterson and Minjoon Jun

Most of the wholesalers, small and large, use managerial judgment in preparing their forecasts ... in large companies, forecasts are primarily prepared by sales and financial managers, and in small companies, by top managers ... most often forecasts are prepared for a period one year or less.

Executives in all industries recognize the importance of the forecasting function for planning and control purposes. While this recognition is near universal, its implementation is not. In fact, there are substantially different forecasting beliefs, practices, and procedures from one industry to another, and one sector of the economy to another.

Wholesalers, like their counterparts in other business operations, are in need of reliable forecasts. This tool is of special importance in this industry, where competition is very intense and customer-buying habits are very dynamic. These conditions make planning and control very important to management and, as such, sales forecasting becomes a vital process.

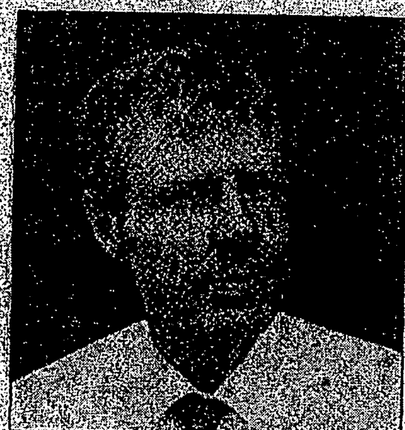
The bulk of the studies on how forecasting is conducted has concentrated on manufacturing, financial institutions, and retail industries. Few inquiries have focused on the wholesaling sector, despite its importance to the performance of the economy. This paper is based upon a study of forecasting practices in the wholesale industry. It is concerned with who prepares forecasts, forecast horizon, methods employed, and the types and forecast accuracy.

THE STUDY

The data were collected by five graduate student interviewers who administered telephone interviews to a randomly selected sample of 484 wholesalers. Initially, the interviewers contacted 1,100 wholesale companies in different cities. The names were selected from the yellow pages. The cities included Seattle, Los Angeles, San Francisco, Las Vegas, Salt Lake City, Phoenix, New Orleans, Denver, Dallas, Kansas City, Houston, Miami, Memphis, Indianapolis, Cleveland, Detroit, Minneapolis, Philadelphia, Chicago, New York City, Pittsburgh, and Boston. Fifty wholesalers were randomly selected from each city. From this list, 484 firms agreed to be interviewed by telephone (producing a response rate of 44.0%). The data for this study was derived from these companies. All interviewers had past experience in telephone interviewing. They received two hours of instruction by the authors. Further, they pre-tested the interview guides on a sample of 50 wholesale firms contacted by telephone. The interviewees were the top managers of the firms or their designees.

RESULTS

It was anticipated that the forecasting practices could differ widely between firms of different sizes. Accordingly, each respondent was asked to specify the number



ROBIN PETERSON

Dr. Peterson is Southwest Financial Services Distinguished Professor at New Mexico State university. He received his Ph.D. from the University of Washington and has written books and articles on forecasting.

MINJOON JUN

Dr. Jun is an Assistant Professor of Management at New Mexico State University. He received Ph.D. from Georgia State University and has written articles on a variety of forecasting related topics.

of individuals employed by the firm. In this study, small firms consist of those with less than 100 employees and large firms of those with 100 or more employees. The sample consisted of 411 small and 73 large wholesalers.

The members of the sample were asked, "Each year, do you prepare a forecast of future sales?" Each large company said "yes." However, 93.2% of small companies prepare some kind of estimate. In general, managers in this industry appear to be committed to estimating their future sales, although a few small firms do not.

TABLE 1
PRIMARY FORECAST PREPARERS

Kind of Forecaster	Large Companies		Small Companies		Total	
	Number	%	Number	%	Number	%
Sales manager	17	23.3	58	15.3	75	16.6
Financial manager	14	19.2	33	8.7	47	10.4
Top manager	9	12.2	108	28.6	117	25.9
Company accountant	8	11.0	54	14.3	62	13.7
Operations manager	8	11.0	24	6.3	32	7.2
Financial analyst	6	8.2	25	6.6	31	6.9
Outside accountant	4	5.5	41	10.8	45	10.0
Consulting firm	4	5.5	14	3.7	18	4.0
Other	3	4.1	21	5.7	24	5.3
Total respondents	73		378		451	

TABLE 2
COMPANY UNITS FOR WHICH FORECASTS WERE PREPARED

Level	Large Companies		Small Companies		Total	
	Number	%	Number	%	Number	%
Entire company	73	100.0	378	100.0	451	100.0
Products or product groups	67	91.8	261	69.0	328	72.7
Groups of customers	65	89.0	239	63.2	304	67.4
Geographic areas	62	84.9	265	70.1	327	72.5
Other	21	28.8	72	19.0	93	20.6
Total respondents	73		378		451	

Note: The percentages don't add up to 100% because many firms prepare forecasts at more than one level.

TABLE 3
PERIODS OF TIME FOR WHICH FORECASTS ARE PREPARED

Level	Large Companies		Small Companies		Total	
	Number	%	Number	%	Number	%
Monthly	32	43.8	39	10.3	71	15.7
Quarterly	49	67.1	43	11.4	92	20.4
Semi-annually	36	49.3	40	10.6	76	16.9
Annually	73	100.0	378	100.0	451	100.0
1-3 years	27	36.9	31	8.2	58	12.9
3-5 years	15	20.5	17	4.5	32	7.1
5 years and over	19	26.0	11	2.9	30	6.7
Total respondents	73		378		451	

Note: The percentages do not add up to 100% because many firms prepare forecasts for more than one time.

FORECAST IDENTIFICATION

The interviewers also asked the respondents, "Who is primarily responsible for preparing the forecast?" Table 1 presents the findings. Overall, the highest rankings were for (1) top managers, (2) sales managers and (3) company accountants. For large companies, the main preparers were (1) sales managers, (2) financial managers, and (3) top managers. In the case of small enterprises, however, the first ranks were held by (1) top managers, (2) sales managers, and (3) company accountants. It is logical that top managers of large companies would be less inclined to be involved in preparing forecasts, since they are heavily involved in organization-wide decision making, and would delegate forecasting responsibility to someone else. Some of the smaller companies, due to their limited size, are less likely to delegate forecasting functions to sales and financial managers than are their larger counterparts.

The members of the sample were asked to specify the level at which the forecasts were prepared. Table 2 sets forth the results. It is apparent that a large percent of them prepare forecasts for the entire company. A small percentage of them, however, prepare product and product group and geographic area forecasts. Still fewer prepare forecasts for separate geographic areas and "other" groupings. Further, more smaller companies do not utilize detailed forecasts to the same extent as do the larger firms. They use product or product group, customer based, geographic area, and "other" estimates less frequently than do larger concerns.

Those firms, particularly the smaller ones, that do not break down forecasts by relevant categories, are not realizing the full benefits of forecasting. By preparing forecasts only on an aggregate level, they are losing some of the planning and control potential. These companies are well advised to implement forecasting programs which produced estimates for categories that are

germane to decision making.

TIME PERSPECTIVE

The members of the sample were requested to specify the time periods for which they prepare forecasts. Table 3 presents the responses. The most frequent mention was one year. This was followed by quarterly, semi-annually, and monthly forecasts, for both large and small companies. Forecasts beyond one year were less for both groups. For all of the time horizons, the percentages were of greater magnitude for larger than for smaller companies.

The general pattern of the respondents is to prepare a one year forecast. Many companies, especially smaller ones, are not employing this tool for shorter than one year or for longer than one year time periods. Forecasts of short and long time horizons could enhance their usefulness in both planning and control processes, especially in volatile industries.

METHODS OF FORECASTING

The respondents were asked to specify what method(s) of forecasting they utilized. Table 4 sets forth the results. Managerial judgment received the largest number of mentions, followed by percentage of last year's sales, and sales force estimates. Next in magnitude were trend extension, customer survey, and "other." While both large and small company managers ranked managerial judgment in first place, the two groups differed substantially on their mentions of other methods. Overall, large companies employed more methods in total. They were strong users of sales force estimates, percentage of last year's sales, and customer surveys. Smaller companies favored percentage of last year's sales and sales force estimates.

It is notable that both large and small companies employed more subjective methods than they did quantitative methods. Managerial judgment and sales force estimates both received a large number of mentions. There were none who specified simulation, economic indicators, or other relatively sophisticated methods. It appears that wholesale managers are by and large inclined to favor techniques that are not unduly complex.

TABLE 4
FORECASTING METHODS UTILIZED

Methods Used	Large Companies Number	Large Companies %	Small Companies Number	Small Companies %	Total Number	Total %
Monthly	32	43.8	39	10.3	71	15.7
Managerial judgment	71	97.3	378	100.0	449	99.6
Sales force estimates	55	75.3	200	52.9	255	56.5
Percentage of last year's Sales	49	67.1	279	73.8	328	72.7
Customer Survey	35	47.9	42	11.1	77	17.1
Trend extension	31	42.5	64	16.9	95	21.1
Regression	22	30.1	35	9.3	57	12.6
Decomposition	16	21.9	29	7.7	45	9.9
Other	8	11.0	56	14.8	64	14.2
Total respondents	73		378		451	

Note: The percentages do not add up to 100% because many firms prepare forecasts using more than one method.

TABLE 5
PERCENT ERROR IN MOST RECENT ANNUAL FORECAST

Percent Error	Large Companies Number	Large Companies %	Small Companies Number	Small Companies %	Total Number	Total %
0-9.9%	25	34.2	51	13.5	76	16.9
10-19.9%	17	23.3	57	15.1	74	16.4
20-29.9%	13	17.8	87	23.0	100	22.2
30-39.9%	13	17.8	132	34.9	145	32.2
40-49.9%	4	5.5	40	10.5	44	9.8
50-59.9%	0	0.0	8	2.2	8	1.8
60-69.9%	0	0.0	3	0.8	3	0.7
70-79.9%	1	1.4	0	0.0	1	0.2
80-89.9%	0	0.0	0	0.0	0	0.0
90-99.9%	0	0.0	0	0.0	0	0.0
Total number	73		378		451	

Note: The percentages do not add up to 100% because many firms report more than one degree of error.

ACCURACY OF THE FORECASTS

The members of the sample were requested to give the accuracy of their forecasts. Table 5 sets forth the results of the tabulated results. It is evident that a number of respondents, particularly those from large companies, achieved reasonable degrees of accuracy. However, a notable percentage indicated that they had experienced appreciable error in their forecasting endeavors. ■

The Jantzen Method of Short-Range Forecasting
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THE FORUM

ROBERT FERBER, *Editor*
Research Professor of Economics
University of Illinois

Rejoinders, Commentaries, and Specialized Articles

The Jantzen Method of Short-Range Forecasting

CARL VREELAND

Sales forecasting by ratio estimation has produced good results for Jantzen Inc. The method is represented here, with the thought that it might be used by other business firms where suitable records are available.

THE ratio-estimate method of forecasting is one whereby the ratio of two samples representing past events is used for predicting the total of such events in the future. For many years the Association of American Railroads has used a form of ratio estimation in preparing forecasts of freight shipments.[1] A suggested application is the calculation of estimated annual sales for all dealers in a certain classification.[2] An example of the latter is Jantzen's method of short-range forecasting, to be discussed in the present article.

The products for which the forecasts are made consist of a number of lines of seasonal, fashion sportswear for men, women, and children. Distribution is international, with Portland, Oregon, as the headquarters for the United States and those foreign countries not served by the company's foreign branches and licensees. Sales are direct to retailers, with thousands of accounts located throughout the United States.

The Method

The samples from which the forecasts are developed consist of the orders received from dealers in the normal course of business, and are used in the order of their receipt. Enough orders, properly distributed with respect to both time and place of origin, constitute a representative sample of the entire market. The question as to the number of orders necessary for an adequate sample and length of time necessary to collect them is answered by the system itself.

Consider the summer sportswear lines of swim suits, playclothes, and related accessory items. In early fall, the Jantzen sales force starts taking the initial orders, most of which are for delivery during the following spring. By about the following April, initial orders will have been obtained from all dealers. Then, during the retail selling season in spring and early summer, many of the same dealers will send in reorders to replenish stocks depleted by consumer purchases. It is the initial orders that provide the basis for the season's estimates; and by the middle of October enough of them are recorded for the first forecast.

The previous year's records provide the dollar total of the last year's initial orders from all stores, and the dollar total of the last year's initial orders from just those stores that have placed initial orders so far this season. The appropriate dollar values substituted in the following model will then give the estimated total dollar volume of initial orders from all stores for this year, assuming that all of last year's accounts will buy again.

• ABOUT THE AUTHOR. Carl Vreeland is Manager of Sales Analysis and Planning for Jantzen Inc. He received his B.S. degree from the School of Business, University of Oregon.

[1] Robert Ferber, "On the Accuracy of Businessmen's Expectations," *Current Economic Comment*, Vol. 16 (May, 1954), pp. 3-12.

[2] William Edwards Deming, *Some Theory of Sampling* (New York: John Wiley & Sons Inc., 1950), p. 170.

$$\frac{\text{Last year's total initial orders from all stores multiplied by This year's initial orders from stores ordering so far}}{\text{Last year's initial orders from the same stores}}$$

Even in the stablest distribution pattern, there is some attrition. Not all of the accounts that bought last year can be expected to buy again, and so an "attrition factor" must be introduced. It represents the proportion of last year's dollar total of initial orders accounted for by those stores that are expected to buy again.

A simple illustration will clarify this statement. Assume for a given line of merchandise for which a forecast is to be made that the total of last year's initial orders was $1,000,000. It is expected that during the current year initial orders will be received from dealers who accounted for $920,000.00 of last year's total. The attrition factor would then be .92. The number of stores that will buy again is not important—it is the proportion of last year's dollar total of initial orders that they accounted for which determines the factor.

While the attrition factor is based on an estimate, company records show that its actual value does not vary more than 1 or 2% from year to year in the established lines of merchandise. Therefore, the value of the factor is determined by the most recent company records.

Some initial orders will be placed by new accounts, or stores which did not buy last year. New and old account orders are combined, to establish the ratio of this year's initial orders to last year's, since it does not matter whether an initial order comes from a new account or an old one. However, it is useful for record purposes to keep new account orders separate from old ones.

Let the following symbols represent the figures used in the estimate:

D = Dollar total of this year's initial orders received so far from old accounts.

L = Dollar total of last year's initial orders from the same accounts.

N = Dollar total of this year's initial orders from new accounts.

A = Attrition factor.

T = Dollar total of last year's initial orders from all accounts.

The model then becomes

$$TA\left(\frac{D + N}{L}\right)$$

The obvious rationale is that the ratio of this year's to last year's initial orders from all accounts that are expected to order will be the same as the corresponding ratio exhibited by orders received so far.

To complete the forecast for the entire season, an estimate of reorders must be made. Reflecting consumer reactions after delivery of initial orders, reorders are received too late in the season for a useful forecast by ratio estimation On the basis of the average relationship of reorders to initial orders in previous years, an addition is made to the initial order forecast. Some error may result because the relationship varies from year to year; but since initial orders account for most of the company's sales, the value of the total forecast is not seriously affected.

For example, in a recent series of forecasts, the largest error among the major merchandise lines resulted in a reorder forecast 40% lower than actual reorders. This was almost double the next largest error. Assuming a perfect estimate of initial orders, the combined forecast of initial and reorders would have been only 11.5% under the actual total.

After the first forecast, estimates are made at weekly intervals during the first three months of the season, and at intervals of two to four weeks after that. The market sample for each estimate consists of the cumulative total of initial orders received. When two successive estimates are in close agreement, the sample of orders probably is representative of the total market. Consistency of additional estimates in succession gives further corroboration. A sample of orders from accounts representing 3 to 6% of the previous year's initial order total is large enough for a useful estimate.

The Records

Sampling of a market ordinarily suggests the collecting of information not available in the normal course of events. The method here has advantages of both convenience and low cost, because the data used are recorded in the regular course of business, although much care must be used in their classification. The proper classification and handling of the thousands of orders involved are facilitated by electronic data processing.

Each account is identified by a permanent customer number. After an initial order is received and tabulated, its dollar total is automatically paired with last year's dollar total of the initial order for the same class of merchandise for the same customer number. Those that do not pair up with anything for last year are from new accounts.

While most stores place one initial order for the season, some may divide the order into two or more parts, each placed at a different time. Pairing of an incomplete order with last year's total initial order from a single store would distort the ratio. For instance, if $100,000 of initial orders were paired with $90,000 of last year's initial orders from the same accounts, and if to this sample were added an incomplete $1,000 order for this year and a complete $10,000 order for last year from the same store, the resulting distortion would be serious.

To prevent distortion, a detailed printed list is made of the paired orders included in each addition to the sample. New account orders are listed separately. The paired list shows for each customer number the amounts ordered this year and last. Each entry on the list is visually checked for probable completeness of this year's order. An aid to judgment here is a record of all of last year's initial orders, arranged by customer number, dollar amount, and date recorded. Data in this year's orders judged to be incomplete are withheld until finally completed. The individual checking of initial orders is essential, and requires only about an hour or two per forecast.

Care must also be taken to keep early reorders and personal orders for store buyers out of the comparison. This is done by classification of the orders as they are received. Each classification must be precisely defined to reduce errors of judgment.

Credits against tabulated order totals also require careful classification. Some represent merchandise that should have been shipped but was not, because of imbalance between orders and available stock. Others represent cancellations of orders that are replaced by revised orders. Any credit which represents an order which should have been shipped is not allowed to reduce the total orders tabulated for forecasting purposes. The classification of credits makes possible a year-end comparison of delivery performance with orders received.

For record purposes, the initial order ratio of old accounts, or $\frac{D}{L}$ is useful, as is the ratio of new to old account orders. Any sudden, radical change in either of these measurements suggests that an error may have been made, and indicates what part of the record which should be checked. Also, management finds the ratio $\frac{D}{L}$ useful as a measurement of the general course of the company's business.

Especially at the beginning of the year it is common to find a higher forecast accompanied by a smaller recorded total of orders than for the same date the year before. This seeming paradox is explained by the ratio $\frac{L}{T}$ for the two dates being compared, because it gives the proportion of total accounts from which orders have been received. A smaller total of orders may have come in at a faster rate, the difference being traceable perhaps to a later start this year, or to delays in market coverage because of severe weather, or because of illness in the sales force.

Reorganization of sales territories, or changes in the personnel of the company's sales force may result in different geographical patterns of orders tabulated on any given date and those for the corresponding date of the previous year. Economic uncertainty may delay certain orders which, however, are sure to be placed eventually. Any one or several of these reasons may and probably would invalidate an initial order ratio based on totals for corresponding dates of successive years. Comparability of samples is assured by using the totals of initial orders received so far this year and those received from the same accounts last year, regardless of the time the orders were placed.

There may be some question regarding the ratio $\frac{L}{T}$ as a logical measurement of the proportion of the company's accounts represented by the sample of orders used. Actually, Jantzen uses this ratio in developing the forecast. First the value of $D + N$ is determined. This is then divided by the ratio $\frac{L}{T}$ and multiplied by the attrition factor A. The rationale here is that if a certain fraction of last year's accounts has given us $D + N$ initial orders so far this year, the total of initial orders for the season will be the total received so far divided by the fraction of last year's accounts represented, and multiplied by the attrition factor. The steps taken are represented by the following model:

$$(D + N) \div \frac{L}{T} \times A$$

By rearranging the terms, it becomes

$$TA\frac{(D + N)}{L}$$

or the model as originally stated.

The Results

Table 1 shows four comparisons of actual forecasts with initial orders finally received. Each yearly total is represented by the figure 100, and the forecasts are in relation to this value. The first two examples represent summer sportswear, and the last two fall sportswear.

In each example, the first estimate of the season is shown, followed by the forecasts for the next seven weeks. The first forecasts for examples 1 and 2, representing summer lines, were made about the middle of October. In the fall lines, represented by examples 3 and 4, the first estimates were made in early April. In example 3, there was no forecast made in the seventh week. By the end of the eighth week, about 80 to 85% of the summer line initial orders had been received; and about 60 to 65% of the fall line orders, the season for booking fallwear initial orders being shorter than for the summer lines.

Forecasts are made during the entire initial order booking season. As the sample of orders received becomes larger and larger, the area of uncertainty becomes progressively smaller. While the late forecasts are valuable as historical records of

TABLE 1
COMPARISON OF FORECASTS WITH ACTUAL INITIAL ORDERS RECEIVED
(Actual initial order total = 100)

	1st week	*2nd week*	*3rd week*	*4th week*	*5th week*	*6th week*	*7th week*	*8th week*
1.	102.0	108.0	108.0	107.4	104.2	102.0	102.0	102.6
2.	109.9	111.2	109.8	108.6	109.1	108.0	106.6	105.4
3.	99.6	101.8	101.2	101.5	101.0	101.5	No forecast	102.0
4.	101.8	100.3	100.2	100.3	99.1	100.6	100.3	100.1

trends, the early forecasts have the greatest value for planning purposes.

In Table 1, the best results are shown by examples 3 and 4. Example 1 represents a series of useful forecasts, with good accuracy from the 5th week on. During the year represented by example 2, a moderate business recession late in the season caused the early forecasts to be too high, although they were stable for a number of weeks. Failure of the method to predict the time and extent of a future business recession did not reduce its value as a useful management tool; any system devised would be subject to the economic uncertainties of the future.

Each total forecast represented in Table 1 is made up of a number of separate forecasts for individual merchandise classifications which correspond as closely as possible to production planning requirements. The smallest classification may account for only about 0.1% of total orders, and the largest may account for 18% or more. As would be expected, variations of the forecasts for the smaller classifications are much greater than for the larger ones. The larger groups show a consistency comparable to that of the examples in Table 1.

Table 2 illustrates the advantage of the Jantzen method over a "naïve" method in which the ratio is based on the volume of initial orders received on the same dates this year and last. The naïve model for forecasting this year's initial order total is

$$\text{Total initial orders received last year} \times \frac{\text{Initial orders received to date this year}}{\text{Initial orders received by the same date last year}}$$

Records are not available to develop naïve forecasts to compare with all the examples in Table 1, but they have been developed for the series represented by example 4.

Differences between the two methods may not always be as large as those in Table 2. If the total of orders received by the same dates on two successive years represent the same proportion of total accounts, the two methods would produce identical results; but for reasons already given, a coincidence of this kind is unlikely.

While accuracy is important, a better basis for judging the success of a forecasting system is its usefulness. The Jantzen ratio-estimate, even when applied to a small sample of tabulated orders, probably will provide a more accurate forecast than the preliminary estimates that must be made before any orders have been received. Even in the case of the second example in Table 1, the early forecasts were closer to the final total than were the preliminary estimates. Aside from a certain amount of judgment in classifying multiple initial orders, as explained above, the ratio-estimate has the advantage of being subject to no feelings or opinions other than those of the store buyers, upon whom the final total depends.

Other Applications

The method described should have application to many businesses with large numbers of customers, most of whom can be expected to order year after year. Where merchandise classifications are not too numerous, and number of accounts not too large, the forecasts might be satisfactorily based on manually kept records; but electronic computers are far better for a large volume of data.

While the Jantzen method is based on a highly seasonal operation, the same principle should be applicable to forecasting of sales that cannot be divided between initial and reorders. Like the ratio used by Jantzen, the usable ratio would be based on comparable samples taken from successive seasons, but would be developed somewhat differently.

TABLE 2
COMPARISON OF FORECASTS OF INITIAL ORDERS BY THE JANTZEN AND NAÏVE METHODS
(Actual initial order total = 100)

	1st week	*2nd week*	*3rd week*	*4th week*	*5th week*	*6th week*	*7th week*	*8th week*
Jantzen method	101.8	100.3	100.2	100.3	99.1	100.6	100.3	100.1
Naïve method	41.0	52.2	63.1	68.4	76.8	82.3	86.3	89.2

Jantzen forecasts are made to cover only one season ending on a specific future date, because future merchandise lines will probably be of entirely different design from those of the current year. Also, there is a lapse of several months between the completion of initial orders for one season and the start of initial orders for the next. For a company with a continuous sales operation, the forecast could be made for a period extending as far into the future as desired; and the period represented by the order samples used to develop the ratio could be a month, week, or other time interval. While the forecast could be based on only the latest sample period, it probably would be better to base it on a moving average of the ratios of the last several periods.

It is not known whether ratio estimation has ever been used for forecasting by a company with a continuous sales operation, and it would probably take a year or more to determine the value of such use. Increasing application of electronic data processing should facilitate development of requisite records and permit wider use of the ratio-estimate as a management tool.

In addition to their use for forecasting, the records would be valuable for development of business data not previously available, such as measurements of the proportion of the company's customers ordering during any given period, and the ratio of new to old account orders. Forecasts could be made and data analyzed on a regional as well as a product basis. Jantzen's experience indicates the ratio-estimate and the data upon which it is based become more and more valuable with use.

Real Models in Marketing, or Phony Games?

CHESTER R. WASSON

Do mathematical models have a role to play in marketing? Do we now have models to offer for business decision? Should the emphasis be on the mathematics, or on the models?

Here are some provocative ideas.

LAZER'S 1962 article, "The Role of Models in Marketing," is a timely addition to a considerable body of literature giving long overdue emphasis to the need for conscious theoretical models in analysis.[1] But it implies a much greater availability of ready-made models than exists.

Are Models Ready for Use?

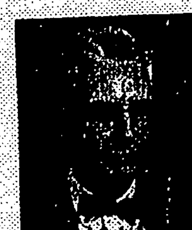
Lazer's inference that we have carefully validated models ready for use is apparent in his reference (as an example of "a real world situation") to the Zentler and Ryde sigmoid curve model of consumer response to advertising expenditures.[2] Actually that study gives a somewhat different impression.[3] Although they do not reveal the stimulus for their effort. Zentler and Ryde appear to be developing a hypothetical exercise rather than making a serious attempt to aid a specific business decision. The model itself is based on the bedrock of a "guess"-assumption that "it seems probable that a curve representing *the individual's* response to steadily increasing promotional activity will have

1 William Lazer, "The Role of Models in Marketing," JOURNAL OF MARKETING, Vol. 26 (April, 1962), pp. 9-14.

2 Same reference as footnote 1, at pp. 10, 11.

3 A. P. Zentler and Dorothy Ryde, "An Optimal Geographical Distribution of Publicity Expenditures in a Private Organization," *Management Science*, Vol. 2 (July, 1956), pp. 337-352.

• ABOUT THE AUTHOR. Chester R. Wasson is Associate Professor of Marketing at The University of Tulsa, and has also taught at Case Institute of Technology, Drexel Institute of Technology, and Roosevelt University.



A graduate in Mathematics at the University of Pittsburgh, he holds a M.S. in Sociology and Economics from Oberlin College, and a Ph.D. in Economics and Sociology from the University of Minnesota.

Before his return to teaching, Dr. Wasson had been an economic adviser to U.S. wartime price and production agencies; a research analyst for Spiegel, Inc., Leo Burnett Company, Inc., and the U.S. Department of Agriculture; and a full-time research consultant.

PAT-NO: JP02001037954A

DOCUMENT-IDENTIFIER: JP 2001037954 A

TITLE: DISPLAY DEVICE FOR COMBINATION OF PICTURES AND GAME MACHINE, AND METHOD FOR DISPLAYING COMBINATION OF PICTURES

PUBN-DATE: February 13, 2001

INVENTOR-INFORMATION:

NAME	COUNTRY
SASAKI, HIROYUKI	N/A

ASSIGNEE-INFORMATION:

NAME	COUNTRY
SEGA CORP	N/A

APPL-NO: JP11217047

APPL-DATE: July 30, 1999

INT-CL (IPC): A63F005/04

ABSTRACT:

PROBLEM TO BE SOLVED: To predict the lottery result of the next game from the previous game and the present game.

SOLUTION: In a picture combination game machine 11, one control **table** corresponding to the inner **lottery** is selected from a plurality of control **tables** every time a game starts, and sliding numbers of the pictures of respective drums 16A to 16C are changed according to the selected control **table** and timing of pushing buttons. Therefore, a game player can **predict** whether a **lottery** result is a big bonus game or a bonus game from a combination of

stopped pictures of a consecutive game. For example, when the picture 7 or BAR is stopped at a center of the central picture display window 15B, an expectation for the next game and a desire to continue the game are increased, and an increase of **sales** can be promised.

(19)日本国特許庁（ＪＰ）　(12) 公開特許公報（A）　(11)特許出願公開番号
特開2001－37954
（P2001－37954A）
(43)公開日　平成13年2月13日(2001.2.13)

(51)Int.Cl.⁷	識別記号	ＦＩ	テーマコード゛(参考)
Ａ６３Ｆ　5/04	５１４	Ａ６３Ｆ　5/04	５１４Ｇ
	５１６		５１６Ｄ

審査請求　未請求　請求項の数８　ＯＬ　（全 19 頁）

(21)出願番号　特願平11－217047

(22)出願日　平成11年7月30日(1999.7.30)

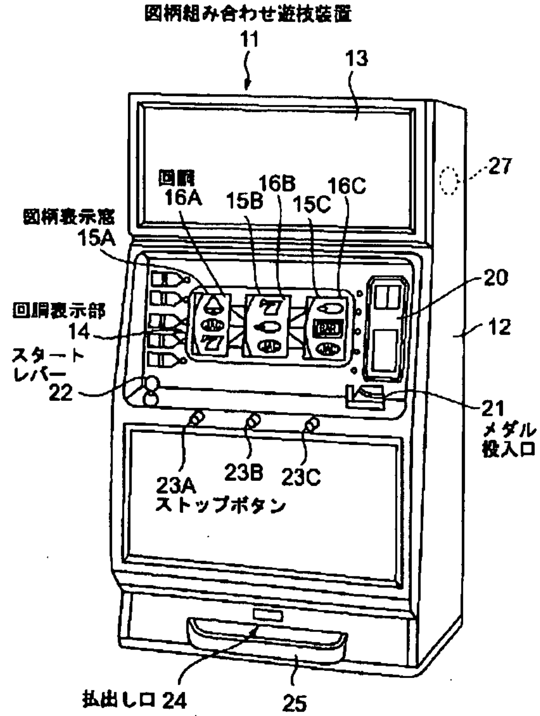
(71)出願人　000132471
株式会社セガ
東京都大田区羽田１丁目２番12号

(72)発明者　佐々木　浩之
東京都大田区羽田１丁目２番12号　株式会社セガ・エンタープライゼス内

(74)代理人　100070150
弁理士　伊東　忠彦

(54)【発明の名称】　図柄組合せ表示装置及び遊技装置及び図柄組合せ表示方法

(57)【要約】
【課題】　本発明は前回ゲームと今回ゲームの結果から次回ゲームの抽選結果を予測できることを課題とする。
【解決手段】　図柄組合せ遊技装置１１では、ゲームが開始される度に複数の制御テーブルのなかから内部抽選に応じた一の制御テーブルが選択され、この選択された制御テーブル及び目押ししたときのタイミングに応じて各回胴１６Ａ～１６Ｃのすべり図柄数が変化する。そのため、遊技者は、連続したゲームの停止図柄の組合せから抽選結果がビッグボーナスゲームあるいはボーナスゲームであるか否かを予測することができるので、例えば中央の図柄表示窓１５Ｂの中央にセブンまたはＢＡＲが停止した場合には、次のゲームへの期待感が高まり、さらにゲームを続けようとする意欲が生まれ、売上げの増加に貢献し得る。



【特許請求の範囲】

【請求項1】　複数種の図柄を表示する複数の図柄表示部と、遊技者の操作に従って前記複数の図柄表示部に前記複数種の図柄の繰り返し表示を開始させる操作開始部と、前記複数の図柄表示部の繰り返し表示を遊技者の操作によって停止させる停止操作部と、前記複数の図柄表示部に停止される図柄の組み合わせを決定する内部抽選を行い、内部抽選の結果に従って前記複数の図柄表示部に図柄を停止させる制御処理を行う制御手段とを備える図柄組合せ表示装置において、

前記制御手段は、前記複数の図柄表示部の繰り返し表示の回数に応じて複数の制御処理の中から一つの制御処理を選択することを特徴とする図柄組合せ表示装置。

【請求項2】　前記複数の制御処理は、前記内部抽選の結果毎に関連する処理であることを特徴とする請求項1記載の図柄組合せ表示装置。

【請求項3】　前記制御手段は、続けて同一の制御処理を選択しないことを特徴とする請求項2記載の図柄組合せ表示装置。

【請求項4】　内部抽選毎に関連する複数の制御テーブルを有し、前記制御手段は、前記制御テーブルに従って制御処理することを特徴とする請求項1または2記載の図柄組合せ表示装置。

【請求項5】　請求項1乃至4のいずれかに記載の図柄組合せ表示装置を備える遊技装置。

【請求項6】　複数の図柄表示部に複数種の図柄を表示する図柄組合せ表示方法であって、

遊技者の操作に従って前記複数の図柄表示部に前記図柄の繰り返し表示を行う過程と、

前記複数の図柄表示部に停止される図柄の組合せを決定する内部抽選を行う過程と、

前記内部抽選の結果と前記繰り返し表示の回数とに応じて複数の図柄停止制御処理の中から一つの図柄停止制御処理を選択する過程と、

選択された図柄停止制御処理に従って前記複数の図柄表示部に図柄を停止させる過程と、

を備えてなる図柄組合せ表示方法。

【請求項7】　前記図柄停止制御処理を選択する過程は、続けて同一の図柄停止制御処理を選択しないことを特徴とする請求項6に記載の図柄組合せ表示方法。

【請求項8】　前記複数の図柄停止制御処理は、前記内部抽選の結果毎に関連する処理であることを特徴とする請求項6又は7記載の図柄組合せ表示方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、図柄の組合せを表示する図柄組合せ表示装置及びスロットマシンやパチスロ機等の図柄組合せ表示装置を有する遊技装置に関する。

【0002】

【従来の技術】例えばゲームセンタやパチンコ店等の遊技施設では、スロットマシンやパチスロ機等の図柄組合せ表示装置を有する遊技装置が設置されている。この種の遊技装置（パチスロ機）でゲームする場合、遊技者はメダルをメダル投入口に投入し、スタートレバーを操作する。これにより、図柄組合せ表示装置の３個の回胴（「リール」又は「ドラム」とも呼ばれる）が回転すると共に、装置内の制御回路において内部抽選処理が行われる。そして、内部抽選の結果に応じて各回胴の停止図柄が制御される。

【０００３】遊技者が各回胴に対応して設けられたストップボタンを押すと、装置内の制御回路は内部抽選の結果に基づいて各回胴の停止制御を行う。全回胴が停止した時点で、表示窓に表示された各回胴の図柄の入賞ライン上の組合せが、予め決められた入賞の組合せと一致すると入賞の役に応じた数のメダルの払出しが行われる。各回胴の制御方式としては、アルゴリズム方式とデータテーブル方式がある。

【０００４】アルゴリズム方式の回胴制御方式では、ストップボタンが操作され、各回胴の位置が検出されると、内部抽選結果に従って各回胴の停止制御をプログラムにて制御する。尚、アルゴリズム方式の場合、データ量が小さいが、プログラムが複雑になり、制御プログラムの作成が面倒である。また、データテーブル方式の回胴制御方式では、ストップボタンが操作され、各回胴の位置が検出されると、内部抽選結果に従って各回胴毎に設けられたデータテーブルが選択され、選択されたデータテーブルに従って各回胴の停止制御を行う。尚、データテーブル方式の場合、データ量が大きくなるが、制御プログラムの作成が簡単に行える。

【０００５】すなわち、制御回路は、アルゴリズム方式、またはデータテーブル方式による演算処理により図柄表示窓に出現する各回胴の停止図柄が決められる。また、パチスロ機では、上記のような３つの回胴間で図柄がどのように配置されるかで当たり役を決定している。さらに、投入されたメダルの数に応じて、３つの回胴の横一列の並びで当たり役を決定するか、横三列の並びで決定するか、または斜め方向も加えて決定するかが決まる。

【０００６】当たり役としては、単発の当たりである小役、所定の当たり役が数回連続するボーナスゲーム、及びボーナスゲームが数回連続するビッグボーナスゲームなどが存在する。

【０００７】

【発明が解決しようとする課題】上記のような従来の図柄組合せ遊技装置では、各ゲーム毎の抽選処理が行われ、この抽選処理により抽出された乱数によってどの当たり役となるのか、あるいは外れとなるのかが決定され、それに応じた図柄の組合せが図柄表示部に表示されるように各回動のすべり時間が調整されて停止位置が制

御される。そのため、例えば抽選結果が連続して外れの場合には、毎回当選を示す図柄が入賞ライン上に停止せず、遊技者にとって面白くないので、ゲームを続ける気持ちが減少する。

【0008】また、従来は、各ゲーム毎の内部抽選が前回のゲームと関係なく行われるため、前回ゲームの図柄表示窓に停止した図柄から今回ゲームの抽選結果を予測することができないので、前回ゲームの内部抽選が外れで今回ゲームの内部抽選の結果が当たりの場合でも、遊技者は前回ゲームの結果が外れの場合には次回ゲームも外れになると思ってしまいゲームを続けようとする気力が薄れてしまう。

【0009】また、前回ゲームの内部抽選でボーナスゲームのフラグが立っている場合、前回ゲームで停止した図柄からボーナスゲームのフラグが立っていることを予測することができないので、遊技者は前回ゲームの内部抽選の結果から今回の抽選結果を予測できず、今回ゲームに対する期待感が減少してしまうといった問題がある。

【0010】そこで、本発明は、上記課題を解決した図柄組合せ表示装置、及び遊技装置及び表示方法を提供することを目的とする。

【0011】

【課題を解決するための手段】上記課題を解決するため、本発明は以下のような特徴を有する。上記請求項1記載の発明は、複数種の図柄を表示する複数の図柄表示部と、遊技者の操作に従って前記複数の図柄表示部に前記複数種の図柄の繰り返し表示を開始させる操作開始部と、前記複数の図柄表示部の繰り返し表示を遊技者の操作によって停止させる停止操作部と、前記複数の図柄表示部に停止される図柄の組み合わせを決定する内部抽選を行い、内部抽選の結果に従って前記複数の図柄表示部に図柄を停止させる制御処理を行う制御手段とを備える図柄組合せ表示装置において、前記制御手段は、前記複数の図柄表示部の繰り返し表示の回数に応じて複数の制御処理の中から一つの制御処理を選択することを特徴とするものである。

【0012】従って、上記請求項1記載の発明によれば、制御手段が複数の図柄表示部の繰り返し表示の回数に応じて複数の制御処理の中から一つの制御処理を選択するため、図柄表示部に表示される図柄を選択的に制御することができ、制御処理の選択に変化を持たせて図柄表示部に表示される図柄の組み合わせにバリエーションを付けることができる。

【0013】また、上記請求項2記載の発明は、前記複数の制御処理は、前記内部抽選の結果毎に関連する処理であることを特徴とするものである。従って、上記請求項2記載の発明によれば、複数の制御処理が内部抽選の結果毎に関連する処理であるため、内部抽選の結果に対して図柄表示部に表示される図柄を関連させることができ、今回の停止図柄と前回の停止図柄とから遊技者は内部抽選結果を推測することができる。

【0014】また、上記請求項3記載の発明は、前記制御手段が、続けて同一の制御処理を選択しないことを特徴とするものである。従って、上記請求項3記載の発明によれば、同一の制御処理が続けて選択されないため、前回の停止図柄と今回の停止図柄との組み合わせにより、内部抽選結果を推測することができる。

【0015】また、上記請求項4記載の発明は、内部抽選毎に関連する複数の制御テーブルを有し、前記制御手段は、前記制御テーブルに従って制御処理することを特徴とするものである。従って、上記請求項4記載の発明によれば、制御手段が内部抽選毎に関連する複数の制御テーブルに従って制御処理するため、内部抽選の結果が連続して外れてもゲーム毎に異なる制御テーブルにより入賞ライン上に表示される図柄が制御されることにより、遊技者に対し、次回ゲームへの期待感を持たせることができる。

【0016】また、上記請求項5記載の発明は、請求項1乃至4のいずれかに記載の図柄組合せ表示装置を備える遊技装置である。従って、上記請求項5記載の発明によれば、遊技装置においても上記請求項1乃至4の図柄組合せ表示装置と同様な効果が得られる。また、上記請求項6記載の発明は、複数の図柄表示部に複数種の図柄を表示する図柄組合せ表示方法であって、遊技者の操作に従って前記複数の図柄表示部に前記図柄の繰り返し表示を行う過程と、前記複数の図柄表示部に停止される図柄の組合せを決定する内部抽選を行う過程と、前記内部抽選の結果と前記繰り返し表示の回数とに応じて複数の図柄停止制御処理の中から一つの図柄停止制御処理を選択する過程と、選択された図柄停止制御処理に従って前記複数の図柄表示部に図柄を停止させる過程と、を備えてなる図柄組合せ表示方法である。

【0017】従って、上記請求項6記載の発明によれば、遊技者の操作に従って複数の図柄表示部に図柄の繰り返し表示を行った後、複数の図柄表示部に停止される図柄の組合せを決定する内部抽選を行い、続いて内部抽選の結果と繰り返し表示の回数とに応じて複数の図柄停止制御処理の中から一つの図柄停止制御処理を選択し、選択された図柄停止制御処理に従って複数の図柄表示部に図柄を停止させるため、遊技者は表示の回数によって入賞ライン上に停止した前回ゲームの停止図柄と今回ゲームの停止図柄とから内部抽選の結果をある程度予測することができ、これにより次回ゲームへの期待感を持たせることができる。

【0018】また、上記請求項7記載の発明は、前記図柄停止制御処理を選択する過程は、続けて同一の図柄停止制御処理を選択しないことを特徴とする請求項6に記載の図柄組合せ表示方法である。従って、上記請求項7記載の発明によれば、図柄停止制御処理を選択する過程

で続けて同一の図柄停止制御処理を選択しないため、内部抽選の結果が連続して外れてもゲーム毎に異なる制御テーブルにより入賞ライン上に表示される図柄が制御されるように制御することができ、前回のゲームがはずれでも次回ゲームで当たりとなる可能性があり、遊技者に対し次回ゲームへの期待感を持たせることができる。

【００１９】また、上記請求項８記載の発明は、前記複数の図柄停止制御処理は、前記内部抽選の結果毎に関連する処理であることを特徴とする請求項６又は７記載の図柄組合せ表示方法である。従って、上記請求項８記載の発明によれば、複数の図柄停止制御処理が内部抽選の結果毎に関連する処理であるため、内部抽選の結果が連続して外れてもゲーム毎に異なる制御テーブルにより入賞ライン上に表示される図柄が制御されることにより、遊技者に対し、次回ゲームへの期待感を持たせることができる。

【００２０】

【発明の実施の形態】以下図面と共に本発明の実施の形態について説明する。図１は本発明の実施の形態に係る図柄組合せ遊技装置の斜視図である。また、図２は図柄表示部を拡大して示す正面図である。図１及び図２に示されるように、図柄組合せ遊技装置１１は、所謂「パチスロ機」と称されるゲーム装置であり、図柄の組合せによってメダルの獲得数を増やすことを楽しむものである。

【００２１】図柄組合せ遊技装置１１は、筐体１２の前面上部に入賞の図柄組合せおよびその払出しメダル数等を表示する表示パネル１３が設けられている。表示パネル１３の下方の中央の透明板に覆われた内側には、回胴表示部１４が設けられている。そして、回胴表示部１４には、３つの縦長矩形の図柄表示窓１５Ａ～１５Ｃが並列に配されており、各図柄表示窓１５Ａ～１５Ｃにそれぞれ外周の前面部分を表示させて３個の回胴１６Ａ～１６Ｃが回転自在に設けられている。

【００２２】回胴１６Ａ～１６Ｃは、偏平円筒状をなし外周面に複数種の図柄１７が一周に亘って配列されたものであり、かかる回胴１６Ａ～１６Ｃが３個左右水平方向に延在する回転中心軸を中心に同一方向に回転される。そして、各図柄表示窓１５Ａ～１５Ｃには、対向する回胴１６Ａ～１６Ｃの前面に位置した３個の図柄１７が表示される。

【００２３】３個の回胴１６Ａ～１６Ｃが停止した状態で、各回胴１６Ａ～１６Ｃにつき３個の図柄１７が表示され、各図柄表示窓１５Ａ～１５Ｃ全体に現れる９個の図柄１７が、３行３列に配置されることになる。また、上中下の水平一直線の３行および中央の図柄を通る斜め一直線の２行の合計５行のラインが入賞ライン18_1～18_5であり（図２参照）、各入賞ライン18_1～18_5の両端部には入賞有効ランプ19_1～19_5が配設されている。

【００２４】回胴表示部１４の右側には、プレイ状態を示す各種表示器２０が設けられている。また、回胴表示部１４および表示器２０の下端は若干前方に張り出していて、その上面右端にはメダル投入口２１が、左端には操作開始部としてのスタートレバー２２が配設され、張出部の前面には前記３個の回胴１６Ａ～１６Ｃの下方にそれぞれ対応して停止操作部としてのストップボタン２３Ａ～２３Ｃが配設されている。

【００２５】筐体１２の下部には、メダルの払出し口２４があり、受け皿２５が前方に突設されていて、筐体１２内部に設けられたホッパー２６（図１では隠れて見えない）により排出されたメダルが払出し口２４から受け皿２５に払い出される。筐体１２の側板に沿ってスピーカ２７が内蔵されており、種々の効果音を発音するようになっている。

【００２６】図２に示す回胴表示部１４において、３行３列に配置される図柄のうち入賞ライン18_1～18_5上に並ぶ３個の図柄の組合せが当落を決めることになり、中位の水平入賞ライン18_1にＩのマークが付され、その上下の水平入賞ライン18_2，18_3にIIのマークが付され、斜めの入賞ライン18_4，18_5にIIIのマークが付されている。

【００２７】そして、メダル投入口２１メダルへのメダル投入枚数が１枚の場合は、上記５本の入賞ライン18_1～18_5のうちＩマークの中位の水平入賞ライン18_1が１本だけ有効となり、同Ｉマーク入賞ライン上に入賞の図柄組合わせが並んだ場合にのみ当たりとなる。また、メダル投入口２１への投入枚数が２枚の場合は、ＩマークとIIマークの上中下３本の水平入賞ライン18_1～18_3が有効となり、この３本の入賞ライン18_1～18_3のいずれかに入賞の図柄組合わせが並んだ場合に当たりとなる。

【００２８】また、メダル投入口２１へのメダル投入枚数が３枚の場合は、Ｉマーク、IIマーク及びIII マークの斜めの入賞ライン18_4，18_5を含め５本全ての入賞ライン18_1～18_5が有効となる。なお、有効となった入賞ライン18_1～18_5の両端の入賞有効ランプ19_1～19_5は点灯して、遊技者に有効な入賞ラインを知らせるようにしている。

【００２９】遊技者がメダル投入口２１へのメダルを投入し、スタートレバー２２がオンに操作されると、ゲームが開始され、各ストップボタン２３Ａ～２３Ｃが順次オンに操作されて３個の回胴１６Ａ～１６Ｃが順次停止するとゲーム終了となり、入賞の図柄が揃うと入賞ランクに応じた数のメダルが払出し口２４から受け皿２５に払い出される。また、スタートレバー２２がオンに操作されると、乱数データテーブルより一の乱数の抽出処理が行われ、この内部抽選によりボーナスフラグ等の当選フラグが立つと上記入賞ライン18_1～18_5上に入賞の図柄が揃いやすくなる。

【0030】そして、図柄組合せ遊技装置１１では、ゲームが開始される度に各回胴１６Ａ～１６Ｃ別に設けられた複数の制御テーブルのなかから内部抽選に応じた一の制御テーブルが選択され、この選択された制御テーブル及び目押ししたときのタイミングに応じて各回胴１６Ａ～１６Ｃのすべり図柄数が変化する。このようにして遊技者は、回胴表示部４の回胴６Ａ～６Ｃにより回胴表示部１４に対向する位置に停止する図柄の組合せを楽しむことができる。

【0031】図3は図柄組合せ遊技装置１１における制御系の概略ブロック図である。図3に示されるように、図柄組合せ遊技装置１１は、内蔵されたマイクロコンピュータ３０により制御され、ＣＰＵ３１の演算処理によりゲームを進行させる。また、ＣＰＵ３１は、ＲＯＭ３２に書き込まれたプログラムに従いＲＡＭ３３を利用して信号処理・駆動制御・乱数抽出・乱数加工・抽選処理などを行う。そして、ＲＯＭ３２には、予め決められた入賞の図柄組合せ、各入賞の当選確率、払出し枚数等のテーブル、乱数表データテーブル（乱数表）が格納されている。また、ＲＯＭ３２には、回胴６Ａの回転制御を行う制御テーブルＬ１～Ｌ８と、回胴６Ｂの回転制御を行う制御テーブルＣ１～Ｃ２８と、回胴６Ｃの回転制御を行う制御テーブルＲ１～Ｒ３１が格納されている（図7を参照）。

【0032】さらに、ＣＰＵ３１には、入力ポート３４を介して種々の信号が入力される。すなわち前記メダル投入口２１から投入されたメダルを検出するメダル投入センサ４０、前記スタートレバー２２の操作で作動するスタートスイッチ４１、前記3個のストップボタン２３Ａ～２３Ｃの各操作でそれぞれ作動するストップスイッチ４２、前記3個の回胴１６Ａ～１６Ｃのそれぞれについて回転の所定位置を検知してリセット信号を出力する回胴位置検出センサ４３、払い出されるメダルを検知するメダル払出センサ４４等からの信号が入力ポート３４を介してメインＣＰＵ３１に入力される。

【0033】一方ＣＰＵ３１からは、出力ポート３５を介してモータ駆動回路４５に指示信号が出力される。そして、同モータ駆動回路４５は3個のステッピングモータ２８を駆動して前記3個の回胴１６Ａ～１６Ｃをそれぞれ回転制御する。回胴１６Ａ～１６Ｃの各図柄は、前記リセット信号を受けてから何パルスだけステッピングモータ２８を駆動すれば表示されるかが決められており、リセット信号を基準にパルス数をカウントして回胴１６Ａ～１６Ｃの回転制御がなされる。また、ＣＰＵ３１は、出力ポート３６を介してメダル払出し信号をホッパー駆動回路４６に出力し、同ホッパー駆動回路４６によりホッパー２６が駆動されてメダルの払出しが行われる。さらにＣＰＵ３１は、出力ポート３７を介してサウンド駆動回路４７および表示駆動回路４８に各指示信号を出力する。

【0034】サウンド駆動回路４７は、指示信号に従ってスピーカ２７を駆動する。そして表示駆動回路４８は、指示信号に従って表示器１９，２０を駆動する。また、ＣＰＵ３１は、後述するように内部抽選の結果及びゲーム数（偶数ゲームか奇数ゲームかを判定する）に基づいて制御テーブルＬ１～Ｌ８，Ｃ１～Ｃ２８，Ｒ１～Ｒ３１の選択処理を行う。すなわち、ＣＰＵ３１は、抽選結果が外れの場合、あるいはビッグボーナスまたはボーナスのフラグが立った場合に分かれて制御テーブル選択処理を行い、且つ前回ゲームで選択された制御テーブルと異なる別の制御テーブルを選択する。

【0035】そのため、遊技者は、ストップボタン２３Ａ～２３Ｃを操作して回胴１６Ａ～１６Ｃを停止させたとき、抽選結果が同じでもゲーム毎に乱数表示部４０で停止される図柄１７の種類が異なり、前回のゲームで停止した図柄１７と今回のゲームで停止した図柄１７とから抽選結果を予測することができる。このように図柄組合せ遊技装置１１は、各回胴１６Ａ～１６Ｃを制御しながらゲームが進行する。

【0036】図4は回胴１６Ａ～１６Ｃに形成された図柄の配列パターンの一例を展開して示す図である。図4に示されるように、回胴１６Ａ～１６Ｃには、セブン図柄、ＢＡＲ図柄、スイカ図柄、ベル図柄、プラム図柄、ＪＡＣ図柄、チェリー図柄等の図柄１７が２１個並んで形成されている。そして、各図柄１７の配列は、回胴１６Ａ～１６Ｃ毎に夫々異なっている。

【0037】なお、各回胴１６Ａ～１６Ｃの外周には、２１個の図柄１７のうち特定の図柄が入賞ライン１８_1～１８_5に並ぶと、ボーナスゲーム、ビッグボーナス、小物、リプレイ等となる。また、図柄には、７、ＢＡＲ、スイカ、ベル、プラム、ＪＡＣ、チェリー等がある。図5は回胴１６Ａ～１６Ｃの各図柄の組合せにより役と配当の一例を示す図である。

【0038】図5に示されるように、各回胴１６Ａ～１６Ｃでスイカ、ベル、プラム、チェリー、ＪＡＣ（リプレイ）がでた場合、そのゲームは当たりとなる。入賞の図柄組合せには、「７－７－７」、「ＢＡＲ－ＢＡＲ－ＢＡＲ」、「スイカ－スイカ－スイカ」、「ベル－ベル－ベル」、「プラム－プラム－プラム」等がある。例えば、一般遊技中、図柄表示窓５Ａ～５Ｃに「７－７－７」の図柄組合せが表示された場合には、「メダル１５枚＋ビッグボーナス」が獲得され、「ＢＡＲ－ＢＡＲ－ＢＡＲ」の図柄組合せが表示された場合には、「メダル１５枚＋ボーナスゲーム」が獲得される。そして、一般遊技中、「Ｓ－Ｓ－Ｓ（スイカ）」がでるとメダル１５枚を獲得し、「ベル－ベル－ベル」がでるとメダル１０枚を獲得し、「プラム－プラム－プラム」がでるとメダル６枚を獲得できる。また、一般遊技中は「チェリー」を入賞ライン１８_1～１８_5に表示させるだけでメダル２枚を獲得できる。

【００３９】また、一般遊技中、「ＪＡＣ－ＪＡＣ－ＪＡＣ」の図柄組合せが表示された場合には、「リプレイ（再遊技）」が獲得される。この「リプレイ」は、再度、入賞ライン18_1～18_5が有効となり、メダルの投入なしで遊技を可能にする。尚、「ＪＡＣ－ＪＡＣ－ＪＡＣ（リプレイ）」がボーナスゲーム中に獲得されると、１５枚のメダルが支払われるようにもなっており、「ボーナスゲーム」の特定図柄になっている。

【００４０】図6は内部抽選による各当たり役の当選確率を示す図である。ＣＰＵ３１は、スタートレバー２２が操作されると、図6に示すような当選確率で当たり判定処理（内部抽選）を行う。そして、一般遊技中またはビッグボーナスゲーム中、抽選の結果当たりになった場合、ストップボタン２３Ａ～２３Ｃの操作により各回胴１６Ａ～１６Ｃでスイカ、ベル、プラム、チェリーがでると、メダルを獲得できる。しかし、各回胴１６Ａ～１６Ｃでスイカ、ベル、プラム、チェリーがでない場合、そのゲームははずれとなり、そのゲームの抽選結果は取り消される。

【００４１】また、ボーナスゲームまたはビッグボーナスゲームが当たると、入賞するまで当たり状態（当たりフラグ）が続く。尚、この間は、ボーナスゲームとビッグボーナスゲームの抽選は行わない。図7は各抽選結果とゲーム数に応じた制御テーブルを示す図である。ここでは、ストップボタン２３Ａ～２３Ｃが左→中→右の順に操作された場合について説明する。

【００４２】図7に示されるように、抽選結果がはずれの場合、左側の回胴１６Ａは制御テーブルＬ１で制御され、中間の回胴１６Ｂは制御テーブルＣ１又はＣ２で制御され、右側の回胴１６Ｃは回胴１６Ａ，１６Ｂの停止形によって制御テーブルＲ１～Ｒ５で制御される。また、ビッグボーナスゲームが当たったときは、左側の回胴１６Ａは制御テーブルＬ２で制御され、中間の回胴１６Ｂは制御テーブルＣ３又はＣ４で制御され、右側の回胴１６Ｃは回胴１６Ａ，１６Ｂの停止形によって制御テーブルＲ６～Ｒ１０で制御される。

【００４３】また、ボーナスゲームが当たったときは、左側の回胴１６Ａは制御テーブルＬ３で制御され、中間の回胴１６Ｂは制御テーブルＣ５又はＣ６で制御され、右側の回胴１６Ｃは回胴１６Ａ，１６Ｂの停止形によって制御テーブルＲ１１～Ｒ１５で制御される。尚、中間の回胴１６Ｂの制御テーブルを選択する際は、ゲーム数をカウントしており、このカウンタの値Ａが0（偶数）または1（奇数）かによって制御テーブルＣ１またはＣ２、Ｃ３またはＣ４、Ｃ５またはＣ６のいずれか一方が選択される。

【００４４】ＣＰＵ３１は、①抽選結果、②投入枚数、③既に停止している回胴の停止図柄、④ゲーム数カウンタ値（偶数または奇数）の各条件によって、ストップボタン２３Ａ～２３Ｃがオンに操作されて各回胴１６Ａ～１６Ｃが停止するまでのすべり図柄数を定義する制御テーブルを制御テーブルＬ１～Ｌ３、制御テーブルＣ１～Ｃ６の中から選択する。

【００４５】抽選結果が「スイカ当たり」の場合、左側の回胴１６Ａは制御テーブルＬ４で制御され、中間の回胴１６Ｂは制御テーブルＣ７～Ｃ９で制御され、右側の回胴１６Ｃは回胴１６Ａ，１６Ｂの停止形によって制御テーブルＲ１６～Ｒ２０で制御される。抽選結果が「ベル当たり」の場合、左側の回胴１６Ａは制御テーブルＬ５で制御され、中間の回胴１６Ｂは制御テーブルＣ１０～Ｃ１２で制御され、右側の回胴１６Ｃは回胴１６Ａ，１６Ｂの停止形によって制御テーブルＲ２１～Ｒ２５で制御される。

【００４６】抽選結果が「プラム当たり」の場合、左側の回胴１６Ａは制御テーブルＬ６で制御され、中間の回胴１６Ｂは制御テーブルＣ１３～Ｃ１５で制御され、右側の回胴１６Ｃは回胴１６Ａ，１６Ｂの停止形によって制御テーブルＲ２６～Ｒ２８で制御される。抽選結果が「チェリー当たり」の場合、左側の回胴１６Ａは制御テーブルＬ７で制御され、中間の回胴１６Ｂは制御テーブルＣ２で制御され、右側の回胴１６Ｃは回胴１６Ａ，１６Ｂの停止形によって制御テーブルＲ１～Ｒ５で制御される。

【００４７】抽選結果が「ＪＡＣ当たり」の場合、左側の回胴１６Ａは制御テーブルＬ８で制御され、中間の回胴１６Ｂは制御テーブルＣ１６～Ｃ２８で制御され、右側の回胴１６Ｃは回胴１６Ａ，１６Ｂの停止形によって制御テーブルＲ２９～Ｒ３１で制御される。図8（Ａ）は抽選結果がはずれの場合の左側の回胴１６Ａの制御テーブルＬ１の一例を示す図である。また、図8（Ｂ）は抽選結果でビッグボーナスゲームが当たった場合の左側の回胴１６Ａの制御テーブルＬ２の一例を示す図である。また、図8（Ｃ）は抽選結果でボーナスゲームが当たった場合の左側の回胴１６Ａの制御テーブルＬ３の一例を示す図である。

【００４８】例えば抽選結果がはずれの場合、回胴１６Ａにおいては、図8（Ａ）に示されるようにスタートレバー２２が操作された後、図柄番号１５「セブン」が図柄表示窓１５Ａの中央にみえたときにストップボタン２３Ａがオンに操作されると、滑る図柄数が3であるので図柄番号１２「プラム」が図柄表示窓１５Ａの中央に停止する。

【００４９】また、抽選結果がビッグボーナスゲームの場合、回胴１６Ａにおいては、図8（Ｂ）に示されるようにスタートレバー２２が操作された後、図柄番号１５「セブン」が図柄表示窓１５Ａの中央にみえたときにストップボタン２３Ａがオンに操作されると、滑る図柄数が0であるので図柄番号１５「セブン」が図柄表示窓１５Ａの中央に停止する。

【００５０】また、抽選結果がボーナスゲームの場合、

回胴１６Ａにおいては、図８（Ｃ）に示されるようにスタートレバー２２が操作された後、図柄番号１５「セブン」が図柄表示窓１５Ａの中央にみえたときにストップボタン２３Ａがオンに操作されると、滑る図柄数が４であるので図柄番号１１「ＪＡＣ」が図柄表示窓１５Ａの中央に停止する。

【００５１】図９（Ａ）は抽選結果がはずれでゲームカウンタＡ＝０（ゲーム数が偶数）の場合の中間の回胴１６Ｂの制御テーブルＣ１の一例を示す図である。また、図９（Ｂ）は抽選結果がはずれでゲームカウンタＡ＝１（ゲーム数が奇数）の場合の中間の回胴１６Ｂの制御テーブルＣ２の一例を示す図である。例えば抽選結果がはずれでゲームカウンタＡ＝０（ゲーム数が偶数）の場合、回胴１６Ｂにおいては、図９（Ａ）に示されるようにスタートレバー２２が操作された後、図柄番号５「チェリー」が図柄表示窓１５Ｂの中央にみえたときにストップボタン２３Ｂがオンに操作されると、滑る図柄数が２であるので図柄番号３「ＪＡＣ」が図柄表示窓１５Ｂの中央に停止する。

【００５２】また、抽選結果がはずれでゲームカウンタＡ＝１（ゲーム数が奇数）の場合、回胴１６Ｂにおいては、図９（Ｂ）に示されるようにスタートレバー２２が操作された後、図柄番号５「チェリー」が図柄表示窓１５Ｂの中央にみえたときにストップボタン２３Ｂがオンに操作されると、滑る図柄数が２であるので図柄番号３「ＪＡＣ」が図柄表示窓１５Ｂの中央に停止する。

【００５３】また、抽選結果がはずれでゲームカウンタＡ＝０（ゲーム数が偶数）の場合、回胴１６Ｂにおいては、図９（Ａ）に示されるようにスタートレバー２２が操作された後、図柄番号３「ＪＡＣ」が図柄表示窓１５Ｂの中央にみえたときにストップボタン２３Ｂがオンに操作されると、滑る図柄数が２であるので図柄番号１「セブン」が図柄表示窓１５Ｂの中央に停止する。そのため、ゲーム数が偶数の場合には、回胴１６Ｂの抽選結果がはずれでも、目押し方法によって図柄番号１「セブン」を図柄表示窓１５Ｂの中央に停止させることができ、遊技者に対し次回ゲームへの期待感を抱かせることができる。

【００５４】また、図１０（Ａ）は抽選結果でビッグボーナスゲームが当たり、且つゲームカウンタＡ＝０（ゲーム数が偶数）の場合の中間の回胴１６Ｂの制御テーブルＣ３の一例を示す図である。また、図１０（Ｂ）は抽選結果でビッグボーナスゲームが当たり、且つゲームカウンタＡ＝１（ゲーム数が奇数）の場合の中間の回胴１６Ｂの制御テーブルＣ４の一例を示す図である。

【００５５】図１０（Ａ）及び（Ｂ）に示されるように、「セブン」を図柄表示窓１５Ｂの中央に停止させるケースが多くなっている。例えばゲームカウンタＡ＝０（ゲーム数が偶数）の場合には、図柄番号１～６、９～１３が図柄表示窓１５Ｂの中央にみえたときにストップボタン２３Ｂがオンに操作されると、「セブン」を図柄表示窓１５Ｂの中央に停止させることができる。また、ゲームカウンタＡ＝１（ゲーム数が奇数）の場合には、図柄番号１～５、９～１３が図柄表示窓１５Ｂの中央にみえたときにストップボタン２３Ｂがオンに操作されると、「セブン」を図柄表示窓１５Ｂの中央に停止させることができる。

【００５６】そのため、ビッグボーナスゲームが当たったときは、ゲーム数が偶数でも奇数でも「セブン」を停止させる確率がかなり高く設定されている。また、ゲームカウンタＡ＝０（ゲーム数が偶数）の場合には、図柄番号１５～１８が図柄表示窓１５Ｂの中央にみえたときにストップボタン２３Ｂがオンに操作されると、「ＢＡＲ」を図柄表示窓１５Ｂの中央に停止させることができる。

【００５７】また、図１１（Ａ）は抽選結果でボーナスゲームが当たり、且つゲームカウンタＡ＝０（ゲーム数が偶数）の場合の中間の回胴１６Ｂの制御テーブルＣ５の一例を示す図である。また、図１１（Ｂ）は抽選結果でボーナスゲームが当たり、且つゲームカウンタＡ＝１（ゲーム数が奇数）の場合の中間の回胴１６Ｂの制御テーブルＣ６の一例を示す図である。

【００５８】図１１（Ａ）及び（Ｂ）に示されるように、ゲームカウンタＡ＝０（ゲーム数が偶数）の場合には、図柄番号１～５、９～１２が図柄表示窓１５Ｂの中央にみえたときにストップボタン２３Ｂがオンに操作されると、「セブン」を図柄表示窓１５Ｂの中央に停止させることができる。ゲームカウンタＡ＝０（ゲーム数が偶数）の場合には、図柄番号１４～１８が図柄表示窓１５Ｂの中央にみえたときにストップボタン２３Ｂがオンに操作されると、「ＢＡＲ」を図柄表示窓１５Ｂの中央に停止させることができる。

【００５９】また、ゲームカウンタＡ＝１（ゲーム数が奇数）の場合には、図柄番号１４～１８が図柄表示窓１５Ｂの中央にみえたときにストップボタン２３Ｂがオンに操作されると、「ＢＡＲ」を図柄表示窓１５Ｂの中央に停止させることができる。図１２は上記図９乃至図１１に示す各制御テーブルのセブンとＢＡＲの停止可能性の有無を示す図である。

【００６０】図１２に示されるように、ゲームカウンタＡ＝０（ゲーム数が偶数）の場合、抽選結果に拘わらずセブン、ＢＡＲの停止の可能性が有る。しかしながら、ゲームカウンタＡ＝１（ゲーム数が奇数）の場合、セブンはビッグボーナスゲームが当たりのときのみ図柄表示窓１５Ｂの中央に停止する可能性が有り、ＢＡＲはボーナスゲームが当たりのときのみ図柄表示窓１５Ｂの中央に停止する可能性が有る。

【００６１】図１３は前回ゲームの停止図柄と今回ゲームの停止図柄との関係を示す図である。図１３に示されるように、前回ゲーム及び今回ゲームでセブンまたはＢ

ＡＲが図柄表示窓１５Ｂの中央に停止した場合、遊技者は、ビッグボーナスゲームあるいはボーナスゲームのフラグが立っているものと判断することができる。例えば前回ゲームでセブンがでて今回ゲームでセブンがでた場合には、ビッグボーナスゲームが当たったものと予測できる。また、前回ゲームでセブンがでて今回ゲームでＢＡＲがでた場合には、ボーナスゲームが当たったものと予測できる。また、前回ゲームでＢＡＲがでて今回ゲームでＢＡＲがでた場合には、ビッグボーナスゲームまたはボーナスゲームが当たったものと予測できる。また、前回ゲームでＢＡＲがでて今回ゲームでセブンがでた場合には、ビッグボーナスゲームまたはボーナスゲームが当たったものと予測できる。

【００６２】従って、遊技者は、連続したゲームの停止図柄の組合せから抽選結果がビッグボーナスゲームあるいはボーナスゲームであるか否かを予測することができるので、中央の図柄表示窓１５Ｂの中央にセブンまたはＢＡＲが停止した場合には、次のゲームへの期待感が高まり、さらにゲームを続けようとする意欲が生まれ、売上げの増加に貢献し得る。

【００６３】ここで、図柄組合せ遊技装置１１のＣＰＵ３１が実行する制御処理につき説明する。図１４はＣＰＵ３１が実行する制御処理のフローチャートである。図１４に示されるように、ＣＰＵ３１はステップＳ１１（以下「ステップ」を省略する）でメダルの投入を受付けており、メダル投入口２１にメダルが投入されてメダル投入センサ４０がオンになると、Ｓ１２に進み、スタートレバー２２がオンに操作されたかどうかをチェックする。

【００６４】Ｓ１２において、スタートレバー１２がオンに操作されると、Ｓ１３に進み、ゲームが開始される。すなわち、Ｓ１３では、乱数カウンタが動作して乱数データテーブルから一の乱数を抽出して抽選処理を行って当たり役の判定処理を行う。次のＳ１４では、３個の回胴１６Ａ～１６Ｃが一斉に回転を開始する。続いて、Ｓ１５に進み、左側の回胴１６Ａのストップボタン２３Ａがオンに操作されたかどうかをチェックする。このＳ１５において、ストップボタン２３Ａがオンに操作されないときは、Ｓ１６に進み、中間の回胴１６Ｂのストップボタン２３Ｂがオンに操作されたかどうかをチェックする。このＳ１６において、ストップボタン２３Ｂがオンに操作されないときは、Ｓ１７に進み、右側の回胴１６Ｃのストップボタン２３Ｃがオンに操作されたかどうかをチェックする。このＳ１７において、ストップボタン２３Ｃがオンに操作されないときは、Ｓ１５に戻り、Ｓ１５以降の処理を繰り返す。

【００６５】上記Ｓ１５において、左側の回胴１６Ａのストップボタン２３Ａがオンに操作されたときは、Ｓ１８に進み、制御テーブルＬ１～Ｌ８のなから抽選結果（当たり役の有無）に応じた一の制御テーブルを選択する。そして、Ｓ１９では、Ｓ１８で選択された制御テーブルに基づいてストップボタン２３Ａがオンに操作されたときの図柄番号に対応する滑り図柄数により回胴１６Ａの停止制御を行う。次のＳ２０では、全ての回胴１６Ａ～１６Ｃが停止したかどうかをチェックする。Ｓ２０において、回胴１６Ａのみが停止しているときは、上記Ｓ１５に戻り、Ｓ１５以降の処理を繰り返す。

【００６６】また、上記Ｓ１６において、中間の回胴１６Ｂのストップボタン２３Ｂがオンに操作されたときは、Ｓ２１に進み、制御テーブルＣ１～Ｃ２８のなから抽選結果（当たり役の有無）に応じた一の制御テーブルを選択する。そして、Ｓ２２では、ストップボタン２３Ｂがオンに操作されたときの図柄番号に対応する滑り図柄数により回胴１６Ｂの停止制御を行う。次のＳ２０では、全ての回胴１６Ａ～１６Ｃが停止したかどうかをチェックする。Ｓ２０において、回胴１６Ａ，１６Ｂが停止しているときは、上記Ｓ１５に戻り、Ｓ１５以降の処理を繰り返す。

【００６７】また、上記Ｓ１７において、右側の回胴１６Ｃのストップボタン２３Ｃがオンに操作されたときは、Ｓ２３に進み、制御テーブルＲ１～Ｒ３１のなから抽選結果（当たり役の有無）に応じた一の制御テーブルを選択する。そして、Ｓ２４では、ストップボタン２３Ｃがオンに操作されたときの図柄番号に対応する滑り図柄数により回胴１６Ｃの停止制御を行う。次のＳ２０では、全ての回胴１６Ａ～１６Ｃが停止したかどうかをチェックする。Ｓ２０において、全ての回胴１６Ａ～１６Ｃが停止しているときは、Ｓ２５に進み、回胴１６Ａ～１６Ｃが停止して各入賞ライン18_1～18_5上に揃った図柄の組合せから入賞かどうかをチェックする。

【００６８】このＳ２５において、入賞ライン18_1～18_5上に揃った図柄の組合せから入賞であるときは、Ｓ２６に進み、当該入賞の種類（図５を参照のこと）に応じた枚数のメダルがメダルが払出し口２４から受け皿２５に払い出される。しかしながら、Ｓ２５において、入賞ライン18_1～18_5上に揃った図柄の組合せがはずれの場合は、メダルの払出しを行わずに今回のゲーム処理を終了する。

【００６９】尚、ストップボタン２３Ａ～２３Ｃの操作手順は、左→中→右の順に操作するとは限らず、例えば中→右→左あるいは右→中→左の順に操作することもできる。図１５は上記Ｓ２１において回胴１６Ｂの制御テーブルを選択する手順を説明するためのフローチャートである。尚、この図１５では、制御テーブルＣ１～Ｃ６の中から一の制御テーブルを選択する場合の処理手順について説明する。

【００７０】図１５に示されるように、Ｓ３１では、今回のゲーム数が偶数（ゲームカウンタＡ＝０）か奇数（ゲームカウンタＡ＝１）かを読み込む。次のＳ３２では、抽選結果がはずれかどうかをチェックする。このＳ

３２において、抽選結果がはずれでないときは、Ｓ３３に進み、抽選結果がビッグボーナスゲームかどうかをチェックする。

【００７１】このＳ３３において、抽選結果がビッグボーナスゲームでないときは、Ｓ３４に進み、抽選結果がボーナスゲームかどうかをチェックする。このＳ３４において、抽選結果がボーナスゲームでないときは、Ｓ３２に戻り、Ｓ３２以降の処理を繰り返す。また、上記Ｓ３２において、抽選結果がはずれのときは、Ｓ３５に進み、ゲームカウンタがＡ＝０かどうかをチェックする。このＳ３５でゲームカウンタがＡ＝０であるときは、Ｓ３６に進み、制御テーブルＣ１を選択する。しかし、Ｓ３５でゲームカウンタがＡ＝１であるときは、Ｓ３７に進み、制御テーブルＣ２を選択する。

【００７２】また、上記Ｓ３３において、抽選結果がビッグボーナスゲームであるときは、Ｓ３８に進み、ゲームカウンタがＡ＝０かどうかをチェックする。このＳ３８でゲームカウンタがＡ＝０であるときは、Ｓ３９に進み、制御テーブルＣ３を選択する。しかし、Ｓ３８でゲームカウンタがＡ＝１であるときは、Ｓ４０に進み、制御テーブルＣ４を選択する。

【００７３】また、上記Ｓ３４において、抽選結果がボーナスゲームであるときは、Ｓ４１に進み、ゲームカウンタがＡ＝０かどうかをチェックする。このＳ４１でゲームカウンタがＡ＝０であるときは、Ｓ４２に進み、制御テーブルＣ５を選択する。しかし、Ｓ４１でゲームカウンタがＡ＝１であるときは、Ｓ４３に進み、制御テーブルＣ６を選択する。

【００７４】このように、ＣＰＵ３１は、内部抽選処理の結果とゲーム数（奇数か偶数）によって制御テーブルＣ１～Ｃ６の中から一の制御テーブルを選択し、選択された当該制御テーブルに基づいて中間の回胴１６Ｂの停止制御を行う。これにより、制御処理の選択に変化を持たせて回胴表示部１４に表示される図柄の組み合わせにバリエーションを付けることができる。よって、遊技者は、今回の停止図柄と前回の停止図柄とから内部抽選結果を推測して、次回ゲームへの期待感を持つことができる。

【００７５】尚、上記実施の形態では、パチスロ機を一例として挙げたが、これに限らず、回胴１６Ａ～１６Ｃの図柄の組合せによりメダルを払出しする図柄組合せ遊技装置であれば、他の遊技装置（例えばスロットマシン等）にも適用できるのは勿論である。また、上記実施の形態では、回胴１６Ａ～１６Ｃの停止位置に応じて図柄表示窓１５Ａ～１５Ｃから見える図柄の組合せによって当たり又は外れとなる回胴表示部１４が設けられているが、これに限らず、例えばＣＲＴディスプレイや液晶ディスプレイ等に回胴表示部１４と同様な画像を表示させて回胴１６Ａ～１６Ｃが回転するのと同じように表示される図柄の画像が変化して停止状態での図柄組合せにより当たり又は外れが決定されるゲーム装置にも適用できるのは勿論である。

【００７６】また、上記実施の形態では、各回胴毎のデータが格納されるデータテーブルを用いて制御処理を行うデータテーブル方式による演算処理方法により内部抽選を行う場合を一例として説明したが、これに限らず、上記抽選処理をアルゴリズム化するアルゴリズム方式により内部抽選を行うようにしても良いのは勿論である。

【００７７】

【発明の効果】上述の如く、請求項１記載の発明によれば、制御手段が複数の図柄表示部の繰り返し表示の回数に応じて複数の制御処理の中から一つの制御処理を選択するため、図柄表示部に表示される図柄を選択的に制御することができ、制御処理の選択に変化を持たせて図柄表示部に表示される図柄の組み合わせにバリエーションを付けることができる。

【００７８】また、上記請求項２記載の発明によれば、複数の制御処理が内部抽選の結果毎に関連する処理であるため、内部抽選の結果に対して図柄表示部に表示される図柄を関連させることができ、今回の停止図柄と前回の停止図柄とから遊技者は内部抽選結果を推測することができる。また、上記請求項３記載の発明によれば、同一の制御処理が続けて選択されないため、前回の停止図柄と今回の停止図柄との組み合わせにより、内部抽選結果を推測することができる。

【００７９】また、上記請求項４記載の発明によれば、制御手段が内部抽選毎に関連する複数の制御テーブルに従って制御処理するため、内部抽選の結果が連続して外れてもゲーム毎に異なる制御テーブルにより入賞ライン上に表示される図柄が制御されることにより、遊技者に対し、次回ゲームへの期待感を持たせることができる。

【００８０】また、上記請求項５記載の発明によれば、遊技装置においても上記請求項１乃至４の図柄組合せ表示装置と同様な効果が得られる。また、上記請求項６記載の発明によれば、遊技者の操作に従って複数の図柄表示部に図柄の繰り返し表示を行った後、複数の図柄表示部に停止される図柄の組合せを決定する内部抽選を行い、続いて内部抽選の結果と繰り返し表示の回数とに応じて複数の図柄停止制御処理の中から一つの図柄停止制御処理を選択し、選択された図柄停止制御処理に従って複数の図柄表示部に図柄を停止させるため、遊技者は表示の回数によって入賞ライン上に停止した前回ゲームの停止図柄と今回ゲームの停止図柄とから内部抽選の結果をある程度予測することができ、これにより次回ゲームへの期待感を持たせることができる。

【００８１】また、上記請求項７記載の発明によれば、図柄停止制御処理を選択する過程で続けて同一の図柄停止制御処理を選択しないため、内部抽選の結果が連続して外れてもゲーム毎に異なる制御テーブルにより入賞ライン上に表示される図柄が制御されるように制御するこ

とができ、前回のゲームがはずれでも次回ゲームで当たりとなる可能性があり、遊技者に対し次回ゲームへの期待感を持たせることができる。

【００８２】また、上記請求項８記載の発明によれば、複数の図柄停止制御処理が内部抽選の結果毎に関連する処理であるため、内部抽選の結果が連続して外れてもゲーム毎に異なる制御テーブルにより入賞ライン上に表示される図柄が制御されることにより、遊技者に対し、次回ゲームへの期待感を持たせることができる。

【図面の簡単な説明】

【図１】本発明の実施の形態に係る図柄組合せ遊技装置の斜視図である。

【図２】図柄表示部１４を拡大して示す正面図である。

【図３】図柄組合せ遊技装置１１における制御系の概略ブロック図である。

【図４】回胴１６Ａ～１６Ｃに形成された図柄の配列パターンの一例を展開して示す図である。

【図５】回胴１６Ａ～１６Ｃの各図柄の組合せにより役と配当の一例を示す図である。

【図６】内部抽選による各当たり役の当選確率を示す図である。

【図７】各抽選結果とゲーム数に応じた制御テーブルを示す図である。

【図８】抽選結果がはずれの場合の回胴１６Ａの制御テーブルＬ１、ビッグボーナスゲームが当たった場合の制御テーブルＬ２、ボーナスゲームが当たった場合の制御テーブルＬ３の一例を示す図である。

【図９】抽選結果がはずれでゲームカウンタＡ＝０（ゲーム数が偶数）の場合の中間の回胴１６Ｂの制御テーブルＣ１、抽選結果がはずれでゲームカウンタＡ＝１（ゲーム数が奇数）の場合の中間の回胴１６Ｂの制御テーブルＣ２の一例を示す図である。

【図１０】抽選でビッグボーナスゲームが当たり、且つゲームカウンタＡ＝０（ゲーム数が偶数）の場合の中間の回胴１６Ｂの制御テーブルＣ３、抽選でビッグボーナスゲームが当たり、且つゲームカウンタＡ＝１（ゲーム数が奇数）の場合の中間の回胴１６Ｂの制御テーブルＣ４の一例を示す図である。

【図１１】抽選結果でボーナスゲームが当たり、且つゲームカウンタＡ＝０（ゲーム数が偶数）の場合の中間の回胴１６Ｂの制御テーブルＣ５、抽選結果でボーナスゲームが当たり、且つゲームカウンタＡ＝１（ゲーム数が奇数）の場合の中間の回胴１６Ｂの制御テーブルＣ６の一例を示す図である。

【図１２】図９乃至図１１に示す各制御テーブルのセブンとＢＡＲの停止可能性の有無を示す図である。

【図１３】前回ゲームの停止図柄と今回ゲームの停止図柄との関係を示す図である。

【図１４】ＣＰＵ３１が実行する制御処理のフローチャートである。

【図１５】Ｓ２１において回胴１６Ｂの制御テーブルを選択する手順を説明するためのフローチャートである。

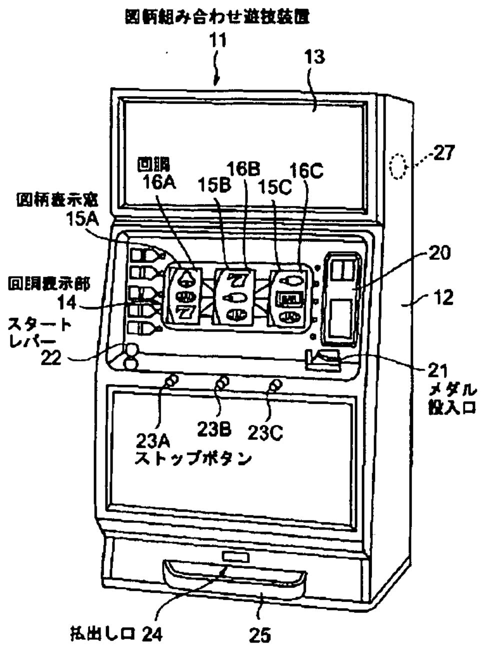
【符号の説明】

１１　図柄組合せ遊技装置
１２　筐体
１３　表示パネル
１４　回胴表示部
１５Ａ～１５Ｃ　図柄表示窓
１６Ａ～１６Ｃ　回胴
１７　図柄
１８　入賞ライン
１９　入賞有効ランプ
２１　メダル投入口
２２　スタートレバー
２３Ａ～２３Ｃ　ストップボタン
２４　メダルの払出し口
２８　ステップモータ
３０　マイクロコンピュータ
３１　ＣＰＵ
３２　ＲＯＭ
３３　ＲＡＭ
４０　メダル投入センサ
４１　スタートスイッチ
４２　ストップスイッチ
４３　回胴位置検出センサ
４４　メダル払出センサ
４５　モータ駆動回路

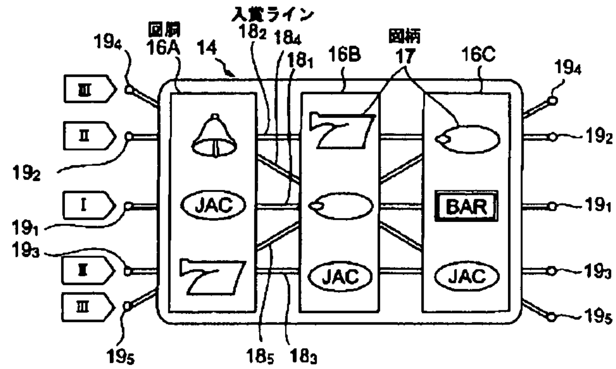
【図１３】

前回ゲーム	今回ゲーム	状態の可能性
セブン	セブン	ビッグボーナス当たり
セブン	BAR	ビッグボーナス又はボーナスゲーム当たり
BAR	BAR	ボーナスゲーム当たり
BAR	セブン	ビッグボーナス又はボーナスゲーム当たり

【図1】



【図2】



【図5】

	役	配　当
一般遊技中	777 BBB SSS △△△ PPP C－－ JJJ	メダル15枚＋ビッグボーナスゲーム メダル15枚＋ボーナスゲーム メダル15枚 メダル10枚 メダル6枚 メダル2枚 再遊技
ビッグボーナスゲーム中	SSS △△△ PPP C－－ JJJ	メダル15枚 メダル10枚 メダル6枚 メダル2枚 メダル3枚＋ボーナスゲーム
ボーナスゲーム中	JJJ	メダル15枚

【図4】

図柄の種類

- 7：セブン図柄
- B：BAR図柄
- S：スイカ図柄
- △：ベル図柄
- P：プラム図柄
- J：JAC図柄
- C：チェリー図柄

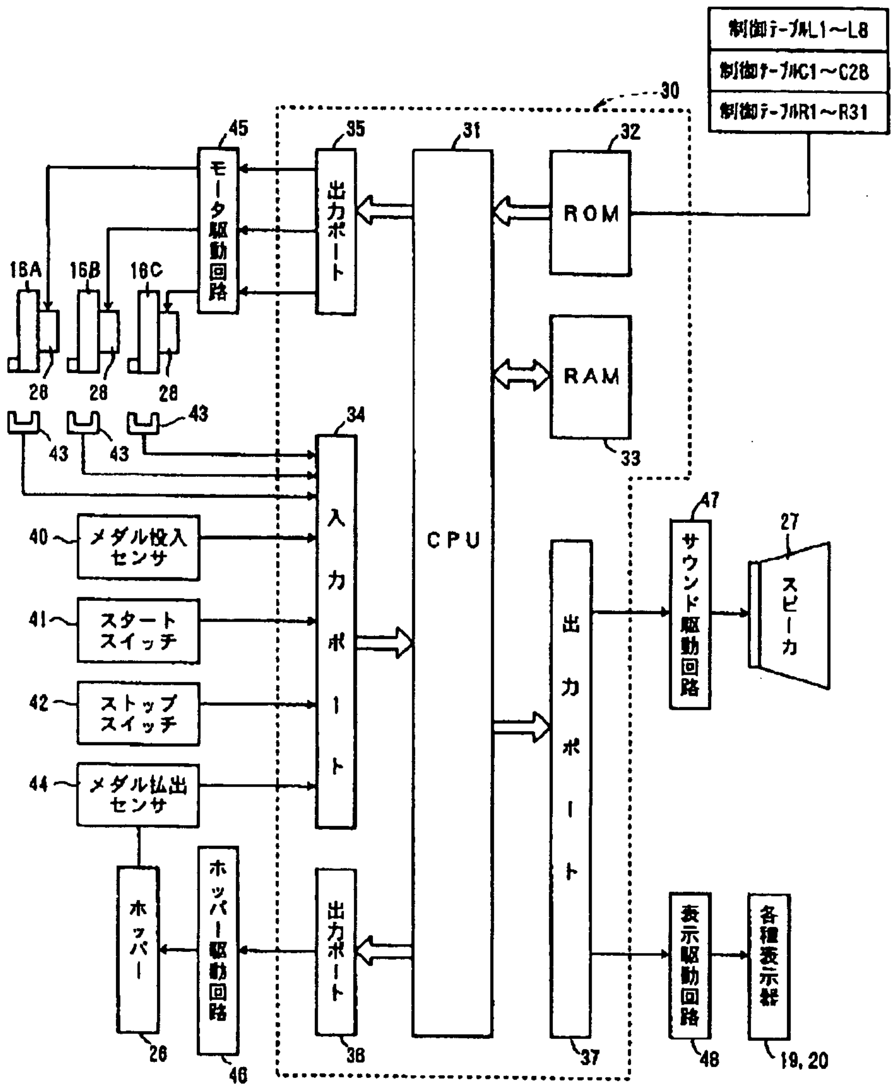
各回胴別の
図柄配列と図柄番号

No	左回胴	中回胴	右回胴
1	7	7	7
2	C	P	J
3	B	J	△
4	J	△	P
5	P	C	S
6	△	P	J
7	J	J	△
8	7	△	P
9	C	7	B
10	B	P	J
11	J	J	△
12	P	△	P
13	△	S	S
14	S	B	C
15	7	P	J
16	J	J	△
17	B	△	P
18	S	C	S
19	P	P	J
20	△	J	△
21	J	△	P

【図6】

	当選確率	配　当
一般遊技中	60／16384	セブン（ビッグボーナスゲーム）の当たり
	40／16384	BAR（ボーナスゲーム）の当たり
	100／16384	スイカの当たり
	300／16384	ベルの当たり
	1500／16384	プラムの当たり
	1000／16384	チェリーの当たり
	2245／16384	JAC（再遊技）の当たり
ビッグボーナスゲーム中	100／16384	スイカの当たり
	100／16384	ベルの当たり
	10400／16384	プラムの当たり
	100／16384	チェリーの当たり
	4000／16384	JAC（ボーナスゲーム）の当たり
ボーナスゲーム中		
	14745／16384	JACの当たり

【図3】



【図12】

状態（抽選結果）	A	制御テーブル	セブン、BARの中リール中央への停止
はずれ	0	C1	セブン、BAR共に停止の可能性あり
	1	C2	セブン、BAR共に停止せず
ビッグボーナスゲーム当たり	0	C3	セブン、BAR共に停止の可能性あり
	1	C4	セブン は停止の可能性有り、BARは停止せず
ボーナスゲーム当たり	0	C5	セブン、BAR共に停止の可能性あり
	1	C6	BARは停止の可能性有り、セブン は停止せず

A＝0→偶数ゲーム
A＝1→奇数ゲーム

【図7】

状態（抽選結果）	A	左リール	中リール	右リール
はずれの場合	0	テーブルL1	テーブルC1	左・中リール停止形によって テーブルR1～R5
	1		テーブルC2	
ビッグボーナスゲーム当たり	0	テーブルL4	テーブルC3	左・中リール停止形によって テーブルR6～R10
	1		テーブルC4	
ボーナスゲーム当たり	0	テーブルL3	テーブルC5	左・中リール停止形によって テーブルR11～R15
	1		テーブルC6	
スイカ当たり		テーブルL4	左リール停止形によって テーブルC7～C9	左・中リール停止形によって テーブルR16～R20
ベル当たり		テーブルL5	左リール停止形によって テーブルC10～C12	左・中リール停止形によって テーブルR21～R25
プラム当たり		テーブルL6	左リール停止形によって テーブルC13～C15	左・中リール停止形によって テーブルR26～R28
チェリー当たり		テーブルL7	テーブルC2	左・中リール停止形によって テーブルR1～R5
JAC当たり		テーブルL8	左リール停止形によって テーブルC16～C26	左・中リール停止形によって テーブルR29～R31

A＝0→偶数ゲーム
B＝1→奇数ゲーム

【図8】

制御テーブル

テーブルL 1（はずれの時の左リール）

(A)

ストップボタンが押された時の図柄番号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
滑る図柄数	3	3	3	0	0	0	3	3	3	3	0	0	0	3	3	3	3	3	3	3	3
停止時の図柄番号	19	20	21	4	5	6	4	5	6	7	11	12	13	11	12	13	14	15	16	17	18
停止時の表示	S P △	P △ J	△ J 7	B J P	J P △	P △ J	B J P	J P △	P △ J	△ J 7	B J P	J P △	P △ S	B J P	J P △	P △ S	△ S 7	S 7 J	7 J B	J B S	B S P

テーブルL 2（ビッグボーナス当たり時の左リール）

(B)

ストップボタンが押された時の図柄番号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
滑る図柄数	1	2	3	4	0	0	0	1	2	3	4	0	0	0	0	0	3	3	3	4	0
停止時の図柄番号	21	21	21	21	5	6	7	7	7	7	7	12	13	14	15	16	14	15	16	16	21
停止時の表示	△ J 7	△ J 7	△ J 7	△ J 7	J P △	P △ J	△ J 7	△ J 7	△ J 7	△ J 7	△ J 7	J P △	P △ S	△ S 7	S 7 J	7 J B	△ S 7	S 7 J	7 J B	7 J B	△ J 7

テーブルL 3（ボーナスゲーム当たり時の左リール）

(C)

ストップボタンが押された時の図柄番号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
滑る図柄数	4	3	3	0	1	2	3	4	3	3	0	1	2	3	4	0	0	0	3	3	3
停止時の図柄番号	18	20	21	4	4	4	4	4	6	7	11	11	11	11	11	16	17	18	16	17	18
停止時の表示	B S P	P △ J	△ J 7	B J P	B J P	B J P	B J P	B J P	P △ J	△ J 7	B J P	B J P	B J P	B J P	B J P	7 J B	J B S	B S P	7 J B	J B S	B S P

【図9】

(C)

テーブルC１（はずれでカウンタＡ＝０の時の中リール）

ストップボタンが押された時の図柄番号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
滑る図柄数	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
停止時の図柄番号	20	21	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
停止時の表示	P J △	J △ 7	△ 7 P	7 P J	P J △	J △ C	△ C P	C P J	P J △	J △ 7	△ 7 P	7 P J	P J △	J △ S	△ S B	S B P	B P J	P J △	J △ C	△ C P	C P J

(B)

テーブルC２（はずれでカウンタＡ＝１の時の中リール）

ストップボタンが押された時の図柄番号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
滑る図柄数	2	2	1	2	2	2	2	2	2	2	1	2	2	2	2	1	2	2	2	2	2
停止時の図柄番号	20	21	2	2	3	4	5	6	7	8	10	10	11	12	13	15	15	16	17	18	19
停止時の表示	P J △	J △ 7	7 P J	7 P J	P J △	J △ C	△ C P	C P J	P J △	J △ 7	7 P J	7 P J	P J △	J △ S	△ S B	B P J	B P J	P J △	J △ C	△ C P	C P J

【図10】

（A）

テーブルC3（ビッグボーナス当たりでカウンタA＝0の時の中リール）

ストップボタンが押された時の図柄番号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
滑る図柄数	0	1	2	3	4	4	2	0	0	1	2	3	4	4	1	2	3	4	2	2	0
停止時の図柄番号	1	1	1	1	1	2	5	8	9	9	9	9	9	10	14	14	14	14	17	18	21
停止時の表示	△ 7 P	△ 7 P	△ 7 P	△ 7 P	△ 7 P	7 P J	△ C P	J △ 7	△ 7 P	△ 7 P	△ 7 P	△ 7 P	△ 7 P	7 P J	S B P	S B P	S B P	S B P	J △ C	△ C P	J △ 7

（B）

テーブルC4（ビッグボーナス当たりでカウンタA＝1の時の中リール）

ストップボタンが押された時の図柄番号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
滑る図柄数	0	1	2	3	4	4	2	0	0	1	2	3	4	4	2	1	2	2	2	2	0
停止時の図柄番号	1	1	1	1	1	2	5	8	9	9	9	9	9	10	13	15	15	16	17	18	21
停止時の表示	△ 7 P	△ 7 P	△ 7 P	△ 7 P	△ 7 P	7 P J	△ C P	J △ 7	△ 7 P	△ 7 P	△ 7 P	△ 7 P	△ 7 P	7 P J	△ S B	B P J	B P J	P J △	J △ C	△ C P	J △ 7

【図11】

(A)

テーブルC5（ボーナスゲーム当たりでカウンタA＝0の時の中リール）

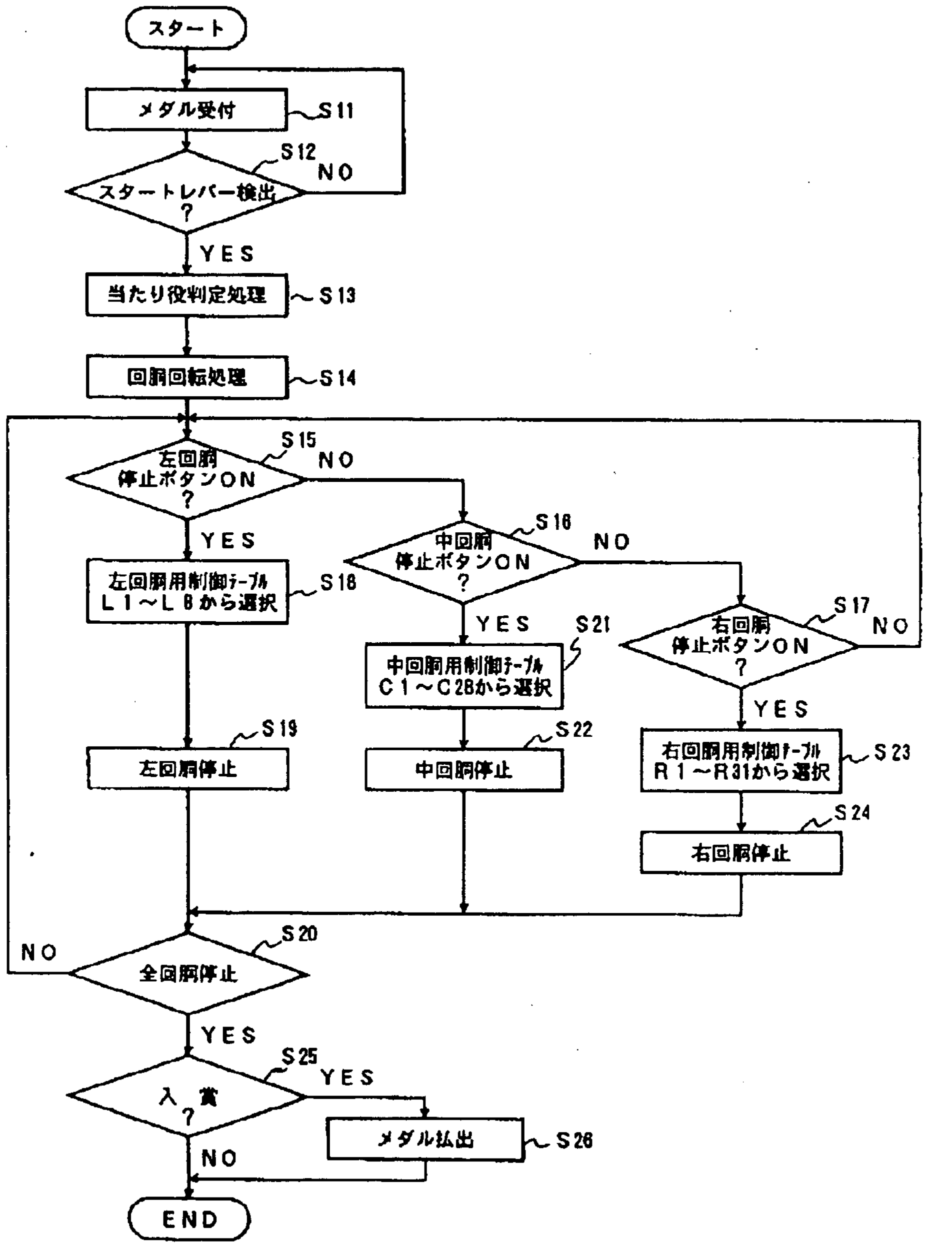
ストップボタンが押された時の図柄番号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
滑る図柄数	0	1	2	3	4	2	2	2	0	1	2	3	0	0	1	2	3	4	4	2	2
停止時の図柄番号	1	1	1	1	1	4	5	6	9	9	9	9	13	14	14	14	14	14	15	18	19
停止時の表示	△ 7 P	△ 7 P	△ 7 P	△ 7 P	△ 7 P	J △ C	△ C P	C P J	△ 7 P	△ 7 P	△ 7 P	△ 7 P	△ S B	S B P	S B P	S B P	S B P	S B P	B P J	△ C P	C P J

(B)

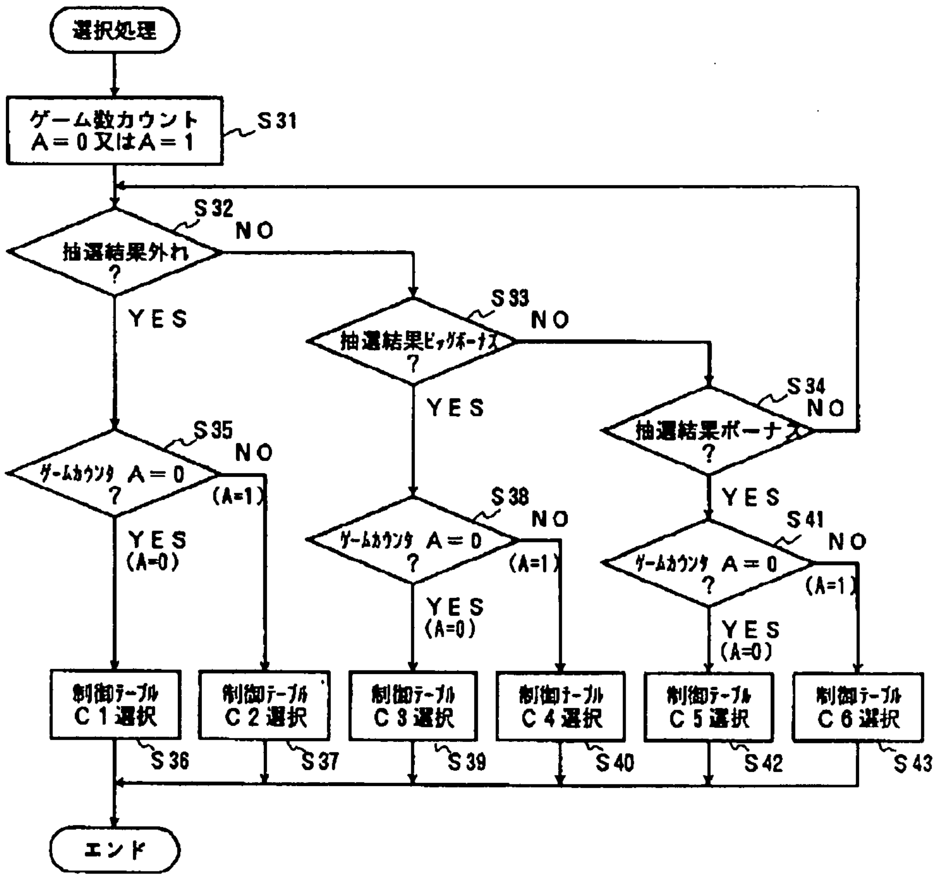
テーブルC6（ボーナスゲーム当たりでカウンタA＝1の時の中リール）

ストップボタンが押された時の図柄番号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
滑る図柄数	2	2	1	2	2	2	2	2	2	2	1	2	0	0	1	2	3	4	4	2	2
停止時の図柄番号	20	21	2	2	3	4	5	6	7	8	10	10	13	14	14	14	14	14	15	18	19
停止時の表示	P J △	J △ 7	7 P J	7 P J	P J △	J △ C	△ C P	C P J	P J △	J △ 7	7 P J	7 P J	△ S B	S B P	S B P	S B P	S B P	S B P	B P J	△ C P	C P J

【図14】


スタート
メダル受付
S11
S12
NO
スタートレバー検出?
YES
当たり役判定処理
S13
回胴回転処理
S14
S15
NO
左回胴停止ボタンON?
YES
左回胴用制御テーブルL1〜L8から選択
S18
S16
NO
中回胴停止ボタンON?
YES
S21
中回胴用制御テーブルC1〜C28から選択
S17
NO
右回胴停止ボタンON?
YES
右回胴用制御テーブルR1〜R31から選択
S23
S19
左回胴停止
S22
中回胴停止
S24
右回胴停止
S20
NO
全回胴停止
YES
S25
YES
入賞?
メダル払出
S26
NO
END

【図15】


選択処理
ゲーム数カウント
A＝0又はA＝1
S31
S32
抽選結果外れ
?
NO
YES
S33
抽選結果ビッグボーナス
?
NO
YES
S34
抽選結果ボーナス
?
NO
YES
S35
ゲームカウンタ A＝0
?
NO
(A=1)
YES
(A=0)
S38
ゲームカウンタ A＝0
?
NO
(A=1)
YES
(A=0)
S41
ゲームカウンタ A＝0
?
NO
(A=1)
YES
(A=0)
制御テーブル
C1選択
制御テーブル
C2選択
制御テーブル
C3選択
制御テーブル
C4選択
制御テーブル
C5選択
制御テーブル
C6選択
S36
S37
S39
S40
S42
S43
エンド

SIMULATED PRODUCT SALES FORECASTING

A MODEL FOR SHORT-RANGE FORECASTING AND OPERATIONAL DECISION MAKING

Donald J. Bowersox, David J. Closs, John T. Mentzer, Jr., and Jeffrey R. Sims

I. INTRODUCTION

Since the Industrial Revolution the complexity of business operations has increased significantly. At the turn of the century, management of inventory for most manufacturing firms involved simply the movement and storage of work-in process within the confines of a single building. Similarly, transportation or traffic management concerned only the movement of a few products within a relatively small geographic area. Such small-scale activity required limited coordination and could be understood and controlled by manual observation and

Research in Marketing, Volume 4, pages 39-68

ISBN: 0-89232-169-5

analysis. In contrast, present physical distribution systems have grown to such proportions that they are difficult for an individual to conceptualize or analyze.

In today's operating environment many firms have in-process and storage facilities spread not only throughout the United States but also around the world. In such firms, inventory must be managed at multiple locations and through numerous marketing channels. Additional complexity has been introduced by recent world events which have placed severe constraints upon the energy resources available to accomplish the logistical mission of coordinated movement and storage. For these reasons, the costs of distribution continue to rise and the control of such operation systems requires improved methods of analysis and information processing.

The science of systems analysis, including computer modeling, has developed to the point where it can aid managers in understanding the myriad of system interrelationships involved in logistical planning. Application of the systems concept requires development of models capable of replicating a part or all of a firm's operating structure. These models can be defined as "a representation of an object, system, or idea in some form other than that of the entity itself [1] ." The research reported in this paper deals with modeling in the areas of demand simulation, statistical forecasting, and dynamic simulation of physical distribution operations.

To date, numerous models have been developed that integrate some aspects of demand simulation, statistical forecasting, and distribution operations simulation (2]. However, the primary deficiency of these models has been their inability to combine the three related areas (forecasting, demand simulation, and dynamic simulation) into a comprehensive decision-making system [3]. A model integrating these components would provide an environment for nonsubjective testing of, plans involving the interaction of distribution operations, forecasting, and other aspects of a marketing strategy. A key potential contribution of such an integrated model is its ability to provide a means to incorporate forecasts into the marketing/distribution decision-making process [3].

The need for such a system was the impetus for development of the Simulated Product Sales Forecasting (SPSF) model. This model combines for analysis the logistical system design factors of facility location, transportation, inventory, and materials movement with decisions concerning sales forecasting. All these areas must interact with various marketing strategy decisions which manifest themselves in product demand patterns impacting upon the logistical system.

The SPSF Testing Environment provides a tool and a methodology for analysis of an integrated physical distribution system. Four modules make up the testing environment. The first module replicates market uncertainty by providing a mechanism to create desired demand patterns. This module allows the researcher to test the performance of the physical distribution operating system under different demand environments. The interface between the demand environment and the operating system is provided by the second module in the form of a sales

forecast. The logistical system utilizes sales forecasting techniques to anticipate demand. The third module is a dynamic simulator which replicates the operations of the physical distribution system. On a daily basis, the simulator processes customer stock and facility replenishment orders throughout the system. The final module integrates the model performance measures for analysis and management reporting. Thus, through the combined efforts of two types of simulation and statistical forecasting, a time-sequenced record of operational events is captured and documented. Such documentation provides the basis for post-mortem evaluation of forecast deficiency and formulates a basis for sensitivity analysis. Perhaps the most beneficial feature of the SPSF model is that it provides an environment for controlled experimentation.

The major limitation of the SPSF model approach is its scope of analysis. Because the model integrates all the components of a logistical system, the modeling of a large distribution system can become unwieldy in terms of the comprehensive information documented and costly in terms of computer time needed. For these reasons, the applicational scope of the testing environment is limited to what is termed a management decision area (e.g., a trading or warehouse service area). This limitation is not restrictive on the operational planning level. However, when a national plan is desired the solution rests on the capability to generalize area results to those of a national scope. The alternative is extensive duplicate analyses.

The remainder of this article discusses the development of the SPSF Testing Environment for use in the analysis of logistics system [4]. Section II provides an overview of the SPSF model design. Sections III through VI discuss, in detail, the Demand, Forecast, Operations, and Analysis Modules of the SPSF Testing Environment. Sections VII through IX present validation and application of the model.

II. SPSF OVERVIEW

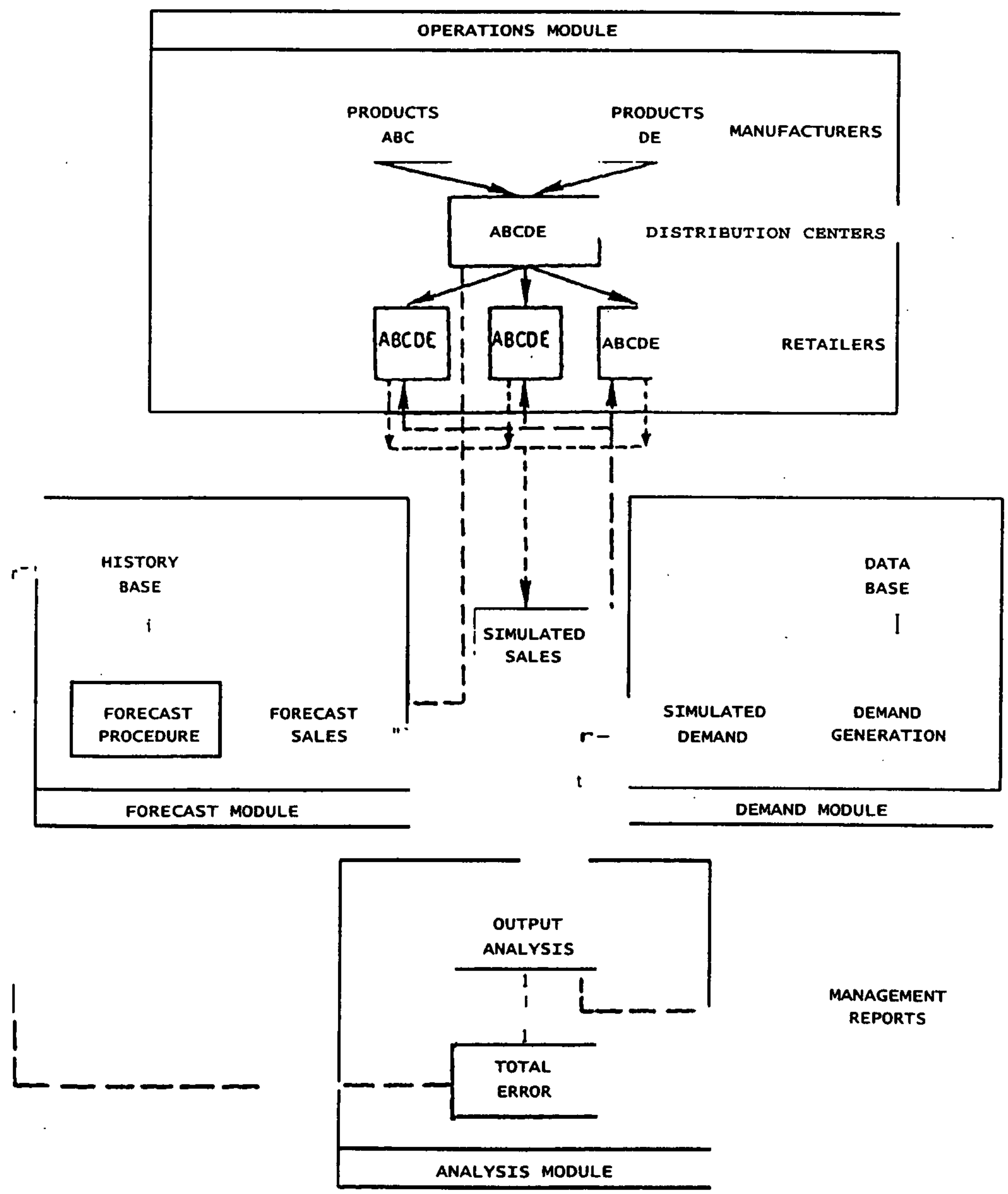
The SPSF Testing Environment consists of four interrelated modules; the Operations Module, the Demand Module, the Forecast Module, and the Analysis Module. Each module provides a specific function in the overall operation of the testing environment. The general design of the SPSF Testing Environment is illustrated in Figure 1.

The Demand Module generates simulated product orders. Orders representing different quantities, levels of business, and patterns of occurence can be developed by the Demand Module. From a design viewpoint, the Demand Module uses four different procedures to generate others. The primary difference between individual procedures is the degree to which marketing and industry factors are included in the order generation process. The significant point about the Demand Module is that it permits the analyst to control the nature of demand confronted by the remainder of the SPSF system. The output of the module is a

daily flow of orders that simulate the business situation under analyusis. These orders are transmitted to both the Operations and Analysis Modules. Thus, a record is established regarding what could be sold in the specific business situation.

The Forecast Module generates an estimate of future sales for use in establishing inventory levels at facilities with the distribution system being simulated. The module offers four different exponential smoothing forecasting procedures ranging in complexity from simple to triple adaptive. The data base for the Forecast Module is limited to sales history decomposed into level, trend, and seasonal components. This partial data base contrasts with the comprehensive data that is

Figure 1. *SPSF Testing* Environment General Design



available to the Demand Module. The forecasts generated are input to both the Operations and Analysis Modules.

The Operations Module is a dynamic simulation of the physical distribution system selected for the business situation under study. This model has the capability to perform total physical distribution operations in a multi-echeloned system structure. The uncertainty inherent in typical operations is replicated in the simulator through the use of stochastic lead times. The typical lead-time components are order-processing and transit times. Thus, utilizing input from both the Demand and Forecast Modules, the Operation Module simulates performance of the specified distribution system and its associated policies across the time horizon of the forecast period.

The output of the individual modules is brought together in the Analysis Module. The Demand Module creates a simulated demand environment. Using less information, the Forecast Module produces an estimate of individual product demand at each facility. The forecast is used to establish desired inventory levels. The Operations Module incorporates spatial and temporal uncertainty to simulate the quantity that the system is capable of selling. Using this combination of inputs, the Analysis Module is in a unique position to report system performance. First, the module provides management information describing the activity, performance, and costs of physical distribution operations. This capability provides management with information to evaluate cost and service implications of alternative system designs. Second, the Analysis Module has access to demand (what *could* be sold), the forecast (what was expected *to be* sold), and the simulated operational results (what *was* sold). Thus, the module can isolate why sales do not match demand. Failure to realize all available sales can be categorized as resulting from either forecast or operating deficiencies. The capability to identify factors that cause the business situation under examination to enjoy less than fully available demand is one of the primary contributions of the SPSF Testing Environment.

From this brief overview it should be clear that the main feature of SPSF is its integration of the four modules into a single testing system. The following four sections discuss each of these modules in greater detail. However, keep in mind that the modules themselves are only of importance when combined to create a total testing environment.

III. DEMAND MODULE

The SPSF Testing Environment is initiated by demand generation. Once a physical distribution operating system is defined, an.analysis of potential system operating efficiency rests on the capability of satisfying a given demand pattern. if the representation of demand is unrealistic or provides an inadequate approximation of actual demand, the modeling results will have limited, if any, operational validity. Similar relationships exist in all forms of simulation experimen-

tation. The applicability of the experimental results is directly proportional to the validity of the environmental replication.

Four alternative procedures are provided in SPSF to create the demand environment: (1) the direct input of historical orders (Procedure One); (2) the generation of an aggregate sales level through a Monte Carlo process followed by a sampling of orders to create individual orders (Procedure Two); and (3) the estimation of an aggregate sales level via multiple regression followed by the order sampling process (Procedures Three and Four). Two alternative regression applications are included, thus providing the four approaches for creating demand.

Demand Module Procedure One utilizes historical orders. These orders contain a processing date and a list of products and quantities that were requested. When the model begins to simulate the activities of the corresponding processing date, the historical demand is submitted for processing. The use of actual demand history is the most simple method of demand replication and in many cases may be the most realistic. Since actual historical orders are used with no stochastic processes, this method does provide the highest accuracy level with regard to historical performance. However, this method has two serious shortcomings. First, it requires the development of an extensive data base since a record of all historical demand must be maintained. Alternative demand generation methods generally utilize a sample of data. Second, the method is inflexible with regard to its ability to create different experimental test conditions.

Demand Module Procedure Two uses random variate generators for normal, log-normal, erlang, and poisson distributions to create the level of aggregate daily sales. The daily sales level is generated using the specified distribution with selected parameters. Once the aggregate sales level is established individual orders are randomly selected from a sample of orders. The sample may consist of actual historical orders and/or exclusively fabricated orders. The fabricated"orders may be structured to simulate experimental conditions such as new product introduction or promotional campaigns. Each order from the sample contains a list of individual products and quantities. Orders are sampled until their combined totals approximate the specified total daily sales. Procedure Two, although easy to use, offers no assurances regarding market reality. The procedure generates orders that are adequate for theoretical experimentation; however, the procedure does not provide adequate environmental control for actual applications.

Demand Generation Procedures Three and Four develop the daily aggregate sales level using regression analysis with economic and strategic variables. For test situations and within limited market areas, it is possible to identify economic indices that can be correlated to sales. Typical factors used in correlation are population, net income, gross national product, housing starts, and selected economic indicators related to the specific products. These factors can also include measures of the firm's operating environment.

When a significant relationship between sales and selected indicators can be identified, the regression procedure for developing demand is more realistic than either Procedures One or Two. In addition to the estimate of current market demand, regression may also be used to project future conditions. The objective of the regression procedures is to estimate aggregate sales. The research did not attempt to establish the regression procedure as a perfect sales predictor. The procedure is used only to approximate the environmental factors that influence sales level. Obviously, the more accurate the representation of the actual market factors, the greater the validity of the results. The following paragraphs discuss the unique features of Procedures Three and Four. Keep in mind that each procedure uses regression to initiate the demand generation process.

Procedure Three uses multiple linear regression to estimate aggregate daily sales. The impact of selected factors upon sales level is measured using least squares regression. The given aggregate daily sales are then decomposed into individual orders through the process described in Procedure Two.

Procedure Four uses a two-step process to arrive at the aggregate sales estimate. The first step estimates industry demand within a specified market area utilizing regression of the following general form:

$$S = a + b_1x_1 + b_2x_2 + \ldots + b_nx_n \tag{1}$$

where

S = industry sales for the period in question;

a = vertical axis intercept;

x_i = independent variable influencing industry sales;

b_i = respective factors of the independent variables.

Equation (1) allows incorporation of any independent variables deemed relevant for the estimate of market area industry sales. It also permits selection of different variables for different environmental situations. For instance, a firm selling household appliances may find housing starts, wholesale price index, and per capita income useful for rendering aggregate forecasts. In contrast, a firm engaged in the marketing of baby products may select different variables.

After industry sales within the market area for the temporal horizon are determined, specific market share for Procedure 4 is approximated using an approach suggested by Kotler [5]. This approach employs a ratio of the subject firm's "marketing effort" to overall industry "marketing effort" to estimate a specific market share. Ideally, such market share formulations should identify the impact that overall marketing strategies have upon a firm's market area demand. However, past and current research has not demonstrated that such a process is either accurate or feasible. Even so, if a moderate relationship can be identified, this procedure may offer the most realistic estimate of total demand

and a given firm's share as expressed in aggregate daily sales. The given aggregate daily sales are then decomposed into individual orders through the process described in Procedure Two.

The purpose of the Demand Module is to provide a controllable mechanism for the creation of daily product orders. Although it would be ideal if one of the procedures could predict actual orders it is not necessary for the purpose of doing meaningful research. The only necessary characteristic is that one or more of the procedures is capable of creating a useful stream of orders for utilization in SPSF operations. The incorporation of multiple individual environmental factors allows for future research investigating the feedback relationships between system performance and the impact of demand environment.

IV. FORECAST MODULE

The Forecast Module provides the interface between the demand environment and the physical distribution operations of the SPSF model. After a careful review of requirements, the forecast techniques that generated the most interest were short-range (one to three months) which required very little, if any, manual intervention.' When monthly forecasts are required for thousands of products at numerous facilities it is not practical to conduct a great deal of manual analysis. Although a single forecasting technique could have been used, the incorporation of four procedures was used to add to model flexibility. In addition, multiple procedures created the potential to evaluate alternate techniques within specific operating situations.

Based upon a literature review [6] and discussions with industry users, four forms of exponential smoothing were selected as typical of widely used short-term forecasting procedures. Although other techniques are used in industry and more sophisticated methods are available, a majority of firms have not advanced beyond exponential smoothing in short-range, detailed forecasting [3]. Following a general description of the processes performed by the Forecast Module, the forecast techniques incorporated are discussed.

The module generates forecasts for specific markets or warehouse service areas. The routine develops and maintains data for use in forecasting. When desired, the module selects one of the four available techniques and the necessary data to generate a short-range product sales forecast. The forecast, in turn, is used to compute order points and order quantities for the Operations Module. The routine, when utilizing an adaptive smoothing technique, evaluates simulated results with the forecast and measurement errors. This differential is utilized to update the smoothing factors for use in future forecasts.

The four forecasting techniques selected for use in the SPSF Testing Environment are:

1. Brown's Basic Exponential Smoothing;
2. P. R. Winters' Exponentially Weighted Moving Averages;

3. Trigg and Leach's Adaptive Smoothing;
4. Roberts and Reed's Self-Adaptive Forecasting Technique.

These techniques are representative of levels of exponential smoothing sophistication. Before discussing each technique, the method by which the forecast is incorporated into the SPSF Testing Environment is reviewed.

For a product, two forecast options exist. The first option is to generate independent forecasts for each facility location specified in the Operations Module. Such locations may be on the same echelon level or at various levels within the system structure. The forecast is generated from an analysis of historical patterns of product sales (throughput) at that location. As such, each forecast is developed independently. For example, even though sales at a manufacturing plant may be dependent upon the requirements of a distribution warehouse, forecasts under option one are generated on an independent basis.

The second forecast option concentrates at the locational level in the system that serves the final customer. Using this approach, a forecast is developed for a number of periods in advance. This forecast is then lagged back to all sources that supply the customer. The lead time used in communicating the dependent forecast back to source facilities is based on the expected replenishment cycle times between the locations. Thus, using this option, the system can exploit the fact that demand is dependent between facilities. A factoring methodology (called bleeding) is used to adjust for the fact that facilities operational in a given test area may also be a functional part of other channels of distribution. The bleeding procedure is discussed further in Section V. The remainder of this section discusses the four forecast procedures.

The first forecast technique is the basic exponential smoothing model originally developed by R. G. Brown [8]. Brown's model applies a static smoothing constant (a) to the immediately previous period's sales and forecast using Eq. (2):

$$F_{t+1} = a(S_t) + (1 - a)(F_t) \tag{2}$$

Where:

F = forecast at time t or t+ 1

S = sales at time t

Since the necessary input is limited to a smoothing factor and one period's data for sales and forecasting, the technique is easy to utilize. Since the technique contains no sales forecast error adaptability or provision to incorporate trend or cyclical variation, it would appear to offer limited capability for generating accurate forecasts. For the development of the SPSF Testing Environment, however, simple exponential smoothing provides a control measure by which the benefit of added forecast sophistication and complexity can be evaluated.

The second forecast technique, P. R. Winters' exponential weighted moving averages, incorporates seasonality and trend in addition to sales level [9]. The smoothing constant (a) is also used in this technique. In addition, procedures are

included for deriving smoothed estimates of seasonality ()3) and of trend (y). The sales forecast is derived by combining all three factors. Since the Winters technique incorporates trend and seasonal variations, it offers a more sophisticated approach in comparison to basic exponential smoothing. However, computation of a single forecast using this technique requires three calculations and the storage of nine data items.

The third technique used in the Forecast MQdule was selected from among several techniques available to introduce the adaptability feature. The Trigg and Leach adaptive smoothing procedure functions with a constant (a) set equal to the absolute value of the tracking signal [101. The tracking signal is a measure of the degree of forecast error. When the error becomes large the tracking signal approaches a value of one. As the value of the tracking signal increases, so does the corresponding value of a. The result is that the smoothing procedure quickly adapts to large differences between sales and forecast. As the error decreases, the tracking signal reduces the value of a, thus adapting the forecast to the new sales level. Although Trigg and Leach offer adaptability, consideration of trend and/or seasonality is not included in their procedure.

The fourth technique includes adaptability plus trend and seasonal components. This is the Self-Adaptive Forecasting Technique (SAFT) developed by Roberts and Reed [11] . SAFT is similar in concept to the Trigg and Leach procedure with the exception that it employs three adaptive constants. SAFT employs the Evolutionary Operations (EVOP) technique of response surface analysis to determine optimal combinations of the values of the three smoothing constants. Using historical data, EVOP systematically adjusts the values of each of the smoothing constants, obtaining a measure of the forecast error for each combination. Each error is squared to form the response surface. This surface is then searched to determine the minimum squared error. The set of smoothing constants which correspond to the minimum squared error is automatically fed into the Winters methodology (Procedure Two). Thus, Roberts and Reed developed what may be termed a closed loop dynamic forecasting technique. Any radical change in the patterns of basic sales, trend, or seasonality which increases forecast error is automatically adjusted for by the establishment of new values for the smoothing constant.

Due to its current popularity, the Box-Jenkins methodology was also considered for integration [7). However, after analysis it was decided that Box-Jenkins required too much human interaction to be feasible for detailed short-range forecasting of the type required by the SPSF model.

The objective of the Forecast Module is to provide a range of techniques for use in the SPSF Testing Environment. One benefit is that the accuracy of the four procedures can be subjected to cost-benefit analysis under controlled environmental conditions. That is, for any specified market area environment, it is possible to test the relative accuracy of each procedure, the value of the increased accuracy offered by the various procedures, and the cost of achieving such enhancement.

V. OPERATIONS MODULE

The Operations Module is a dynamic simulator that integrates input from the Forecast and Demand Modules in a manner that permits both time- and function-dependent events to be simulated and observed. The Operations Module is designed to model individual events involved in the performance of the physical distribution process. Table 1 lists the events and their basic functions. Each event occurs on an independent basis. The dynamic characteristic of actual operations is achieved through event interaction. As an example, the Inventory Management Event checks the product inventory status at each facility at a specified time. When the inventory-on-hand drops below the specified reorder point, the simulator creates a replenishment order. The order is then held in a queue until the appropriate cycle time has elapsed. When the simulated time has passed, the Replenishment Order Processing and Replenishment Order Shipping Events process the order by deducting the quantities from inventory while incrementing the sales accumulators. The order is then assigned a stochastic transportation time and resubmitted to the queue until the appropriate time passes.

In the linkage of events, the manner in which elapsed performance time is created is critical for the model to capture the dynamic realism of distribution operations. Such realism is achieved through the use of stochastic cycle times. Order cycle components requiring stochastic time variables are communication, order processing, and transportation.

An additional feature of the Operations Module is the capability to incorporate a flexible distribution structure. Specifically, the Operations Module can simulate up to fifteen locations and handle up to ten products or groups of products. Inventory locations may be arranged in any number of echelons, or in any pattern of flow from manufacturing plants to customers. Customer locations can be replicated as specific accounts or demand areas.

Figures 2 and 3 illustrate the structural flexibility inherent in the Operations Module. The simplified distribution structure in Figure 2 illustrates inventory stocking at three locations with product shipment from a manufacturing plant to a distribution center and then to the customer. Although such a simplified distribution structure would seldom be found, the structure provides a useful basis for the analysis of specified policies. Typical policies capable of testing are illustrated on the right side of Figure 2.

Figure 3 provides a more complex example of a distribution structure which consists of twelve locations in four echelons. In addition, this example illustrates multiple source destinations and direct or bypass shipment capabilities from the manufacturer to distribution center locations. It is important to note that the figures illustrate only two typical system configurations which can be simulated within the Operations Module. The illustrations do not include the total SPSF Testing Environment in that the Forecast, Demand, and Analysis Modules are not included.

The flow of the Operations Module is controlled by an event sequencer. All

Table 1. SPSF Events and Function

Event	Function
Data Read	Accepts parameters and variables, market and warehouse definitions.
Network Configuration	Configures the distribution system by integrating nodes, links, and the geographic market area as managerially specified.
Demand Forecasting	Uses one of the pre-defined forecasting techniques to forecast product sales-for the market area. This forecast can either be built up through the system back to the manufacturing facility, or each echelon can be forecasted independently. The forecasts will be offset by the lead times when necessary.
Demand Generation	Generates pseudo customer orders for use in approximating the uncertainty of the demand environment.
Customer Order Processing	Processes the customer demand for each simulation period. The de-

Table 1. *SPSF* Events and Function (continued)

Event	Function
	mand is provided via a call to the Demand Module.
Demand Bleed-Off	Due to the fact that all of the locations receiving shipments from a warehouse or manufacturing location may not be included in a desired configuration, this event automatically reduces the inventory available to simulated locations according to the percentage of the total inventory at the stocking location that the simulated locations receive in actuality.
Inventory Management	Accumulates the daily state measurements so that averages may be reported. In addition, this event initiates replenishment orders when the inventory level drops below the designated reorder point.
Production	simulates the production function by incrementing the product in-

(continued)

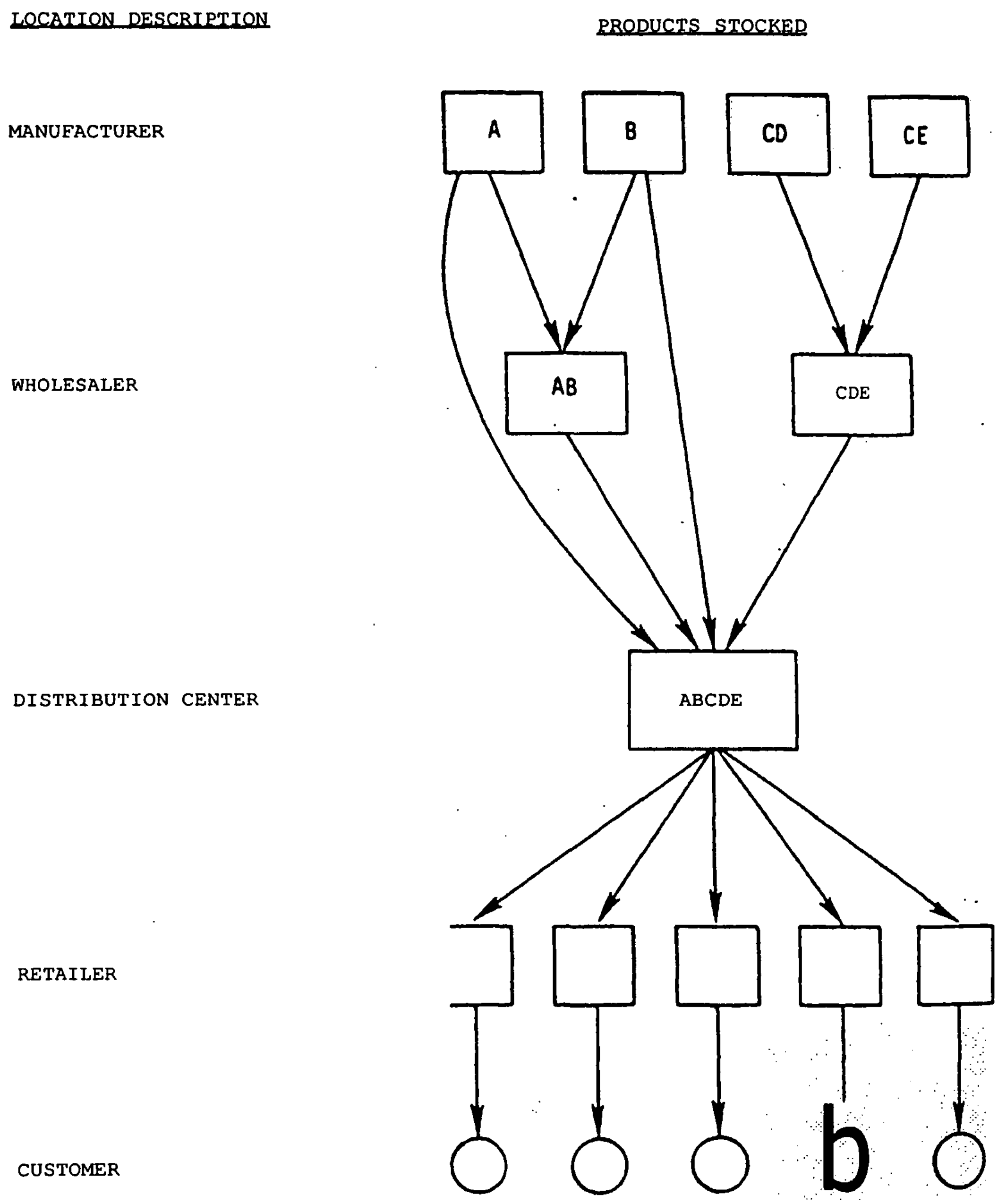
Table 1. *SPSF* Events and Function (continued)

Event	Function
	ventory at the manufacturing facilities when scheduled or necessary, with or without uncertainty.
Replenishment Order Processing	Initiates the order processing phase for replenishment orders at the source location.
Replenishment Order Picking	Completes the processing of the replenishment order and initiates the shipment of the order.
Shipment Arrival	Simulates the arrival of the replenishment order through adding the quantities into inventory-on-hand.
Back-Order Checking	Reviews the back-order queue after the arrival of additional inventory to determine if any of the back-orders can now be filled.
Report File Generation	Reports the current values of all status and flow variables to a file that is suitable for input to the cost or report modules.

Figure 2. **Example of Simplified Distribution Structure**

LOCATION DESCRIPTION	PRODUCTS STOCKED	ALTERNATIVE POLICIES
MANUFACTURER	ABCDE	PRODUCTION POLICIES INVENTORY POLICIES ORDER PROCESSING TIMES
		AVAILABLE TRANSIT MODES SPEED AND CONSISTENCY OF COMMUNICATION AND TRANSIT TIMES
DISTRIBUTION CENTER	ABCDE	FORECASTING METHODOLOGY INVENTORY AND STOCKING POLICIES ORDER PROCESSING TIMES REVIEW PERIODS DEMAND DRAW-OFF FUNCTIONS REPLENISHMENT ORDER FACTORING METHODS
		AVAILABLE TRANSIT MODES SPEED AND CONSISTENCY OF COMMUNICATION AND TRANSIT TIMES
RETAILER	ABCDE	INVENTORY AND STOCKING POLICIES REVIEW PERIODS REPLENISHMENT ORDER FACTORING METHODS FORECASTING METHODOLOGY
CUSTOMER		DEMAND LEVEL AND VARIABILITY

Figure 3. Example of Complex Distribution Structure



events are initiated by the event sequencer. When events scheduled during a particular operational period are completed, the simulation period counter is incremented by one. The value of this counter "clock" is then checked against the predetermined ending number for the simulation. If time remains in the simulation the model returns to the event sequencer and begins event processing for the next day.

VI. ANALYSIS MODULE

The Analysis Module utilizes the information developed by the simulator to produce management and error reports. This subsystem consists of three independent programs which utilize model results for summarizing system performance. The Cost Generator uses the physical distribution flow and level information to calculate the cost of system operation. The Report Generator formats and prints management reports. These reports provide the details and a summary of system performance. The third program is the Error Analysis Routine which details the reasons for each stockout. This program allows the researcher to identify whether the source of the stockout was the forecast technique or physical distribution operating system. The following sections discuss the details of each program.

A. Cost Generator

The Cost Generator is an independent routine which may be used to compute costs incurred by simulated distribution operations. The independent operation of this routine has two benefits. First, the absence of the cost components in the simulation model provides a more efficient utilization of computer core and thereby reduces run requirements. Second, the use of an independent Cost Generator permits sensitivity analysis of different cost assumptions without incurring the additional time and expense of duplicate simulations.

The individual costs included in the generator are transportation, warehousing, storage, inventory, ordering, and back-order costs. Each includes fixed and variable components as desired. The computation of costs is linear and dependent on either a unit of throughput or an average storage level. Since the operations simulator is a dynamic model, accurate measurement and costing of both status and flow variables are possible. A summary of the cost elements and the method of computation is presented in Table 2.

The Cost Generator obtains inputs from two sources. Data related to distribution operations are obtained as output from the Operations Module. Cost parameters applicable to a specific simulation are provided as direct inputs. Given these two inputs, the Cost Generator creates a data file which contains the simulator output as well as calculated costs. This file is the primary input to the Management Report Generator.

A final aspect of the Cost Generator is a review of the basic characteristics of each cost element. Transportation cost is computed for all replenishment orders on the basis of the weight shipped. In addition to being dependent on the source and destination of the shipment, the rate is also based on the transportation mode. For each pair of linked locations, up to six different weight breaks may be used to represent alternative modes. There is a fixed transportation cost available at each origin location to permit simulation of private fleet operations.

Table 2. Cost Function Summary

Cost Element:	Can Be Uniquely-Defined By:	Is a Function o :	Components:
Transportation	Shipping Source Shipment Destination	Weight Shipped	Variable Fixed
Warehousing (Throughput)	Location Product	Weight, unit, or cube Throughput (In, Out, or In+Out) /2)	Fixed Variable
Warehousing (Storage)	Location Product	Average Inventory Level Elapsed Time	Variable
Inventory Cost (Includes Storage)	Location	Average Inventory Level Elapsed Time	Variable
Order Cost	Location (Shipping)	Number of Orders Number of Lines	**Fixed** Variable
Back-Order Cost	Location (Shipping)	Number of Orders Back-ordered	Variable

Warehousing cost consists of handling and storage. The handling cost, which is unique by product and facility location, is based on throughput. Handling costs include fixed expenses related to labor, suppliers, and material handling equipment. The variable portion of handling is based on weight, cube, or units, and can be calculated on inbound volume, outbound volume, or an average of the two. The second aspect of warehouse expense is storage. Storage is a variable cost based on average inventory level. The components of storage include building depreciation, utilities, and any other facility-specific charges.

Inventory cost is variable and is calculated as a function of the average inven-

tory level at a facility. The assessment percentage may be varied by product and location if management desires.

The cost for order placement and processing is assessed at the shipping location on both a fixed and variable basis. The variable cost is calculated as a function of the number of orders and the number of lines shipped. The variable cost covers expenditures such as labor and supplies. The fixed cost element, which is assessed on a per order basis, covers such items as computer hardware and supervisory expenses.

The final cost relates to back orders. The variable charge may be assessed against all out-of-stocks. The charge is assigned on a location basis and is based upon a managerial estimate.

The calculation of the cost is based on the activity level experienced in the operations simulator. It provides a basis for managerial review of alternative operating configurations and policies. Reports that are available to management regarding these expense levels are discussed next.

B. Report Generator

This Analysis Module component produces management reports for system performance evaluation. The Report Generator is independent of the remainder of the SPSF Testing Environment in that an intermediate file is used to pass the output from the simulation to the Report Generator. This intermediate file may or may not be passed through the Cost Generator for computation of system costs.

The input to the Report Generator includes simulator output and a small number of parameter cards. The general type of parameter information necessary includes descriptive names of the facility locations, customers, products, run identification information, and report selection parameters. These descriptors make the model output more intelligible to readers. The report selection parameters define the level of report detail desired.

There are twenty-four available reports which detail five information groups. The groups and their reports are illustrated in Table 3. Each report group is discussed below [4].

1. Sales and Physical Levels This group includes both the market area and the interfacility sales for each system location. This information is available by facility or by facility-product detial. The reports summarize sales information by dollars, net weight, and unit, as well as by lines and orders. In addition, this group details average inventory level. along with a record of transfers and a count of all open orders. Finally, this group reports the system bleed-off on an individual product basis. Bleed-off is necessary to permit a partial system simulation to function within a total firm operating environment.

Table 3. **Report Groups and Records**

Groups	Records
Sales and Physical Levels	System Customer Sales
	System Shipments
	System Receipts
	System *Inventory* Report
	Replenishment Sales
	Replenishment Sales and In-Transit Inventory
	Replenishment Volume: Weight Shipped
	Product Inventory Report
	Product Sales Report (Units)
	System Bleeding Report
	Product Bleeding Report
Costs	System Cost
	Replenishment Volume: Cost of Shipping
Service	System Service Measure
	System Percentage of Orders by Quantity Met
	System Back-Order Recovery and Thousands of Dollars Filled Within Days
	Replenishment Order Cycle Time Summary
Error	Operating Error Report
	Forecasting Error Report
Managerial Summary	Run Summary: Sales
	Run Summary: Service
	Run Summary: Inventory and Back Orders
	Run Summary: Costs

2. Operating Costs. The second group of reports presents operating costs. The individual functions that are costed include inventory, storage, handling, order processing, and freight. The information for each of these reports is computed by the Cost Generator.

3. Service. The third group of reports present operating results which provide the market area and inter-facility service measurement. The service group contains three types of reports. One series of service reports provides a record of the stockouts for customer demand and replenishment demand. This information is presented by location and product.

The second service measurement report consists of a record of the replenishment order cycle time components and variances. The individual time elements include communication, processing, back-order delay, and transit. Since this information is order oriented rather than product oriented, it is summarized only by facility.

The third service report consists of order cycle time and back-order recovery information. These reports are summaries of order information which are compiled by location. Using a list of service standards as defined through the input parameters, the model adds the dollar value of each order with respect to time and recovery.

4. Error. The fourth category of reports for the operations simulator elaborates two types of error that the SPSF Testing Environment identifies. The first is the forecast error, which is the difference between the quantity forecasted and the quantity demanded. Although the forecast error could be computed without the use of the Operations Module, it is measured as the demand is processed so that the time frames are synchronized for measuring operational error.` The second component of the error measurement is the difference between what the inventory level actually is and what it should be, based on the forecast. This form of error is referred to as operational error. Referring back to Figure 1, the combination of forecast error and operational error was identified as total error.

5. Managerial Summary. The final category consists of four reports which provide a managerial summary of the performance of the simulated system. The first report is the summary of both customer and replenishment sales on a report period and year-to-date simulation basis. The system service summary is provided in the second report, detailing both percentage of lines and orders met by the system, as well as the mean and standard deviation of the order cycle time. The' third report summarizes beginning and ending inventories for the total system and the quantity, as well as average recovery time of back orders. The fourth and final summary report provides both total operating and inventory costs on an aggregate and per-hundredweight basis.

In total, the SPSF Report Generator provides information which details operations over the length of the simulation run. These reports provide the means whereby logistical operations may be analyzed to isolate and evaluate system characteristics and performance.

VII. VALIDATION

Validation of the SPSF Testing Environment utilized a two phase procedure. The model was first tested using controlled data to establish that the programs performed as desired. The second phase used actual data to determine whether or not the model, as a whole, performed as expected. The following discussion briefly outlines the questions that were investigated and the results obtained when evaluating the testing environment.

A. Initial Model Validity

The first phase of testing model validity addressed the basic question of whether or not the model operates as desired. This phase established that the computer program(s) operated correctly. The performance of four tasks was required to complete this phase of validation. The first task involved a detailed evaluation of the program flow and logic while processing a limited test application. This established that the program flow and logic appeared to operate correctly. The stochastic variable generators were also evaluated for fit and stability as a part of this first task. Task 2 utilized a review board of academicians and distribution practitioners to determine whether the individual simulated activities adequately modeled the desired distribution activities. Task 3 selected a measurement variable and then statistically evaluated the point and dynamic stability of the model. For validating SPSF, the service level was selected as the stability measure. Statistical analysis was performed for both high and low variance conditions. The validation results statistically demonstrated that the model produced stable results. Task 4 evaluated model performance under different sets of environmental and policy conditions. The objective of this task was to determine whether the model, under the controlled conditions, responded to changes in its environment in a manner similar to an actual distribution system. Once again the model was judged valid.

The results obtained from the performance of all four tasks indicated that the basic model was valid. However, tests of true model validity are data dependent and can only be evaluated after repeated applications in actual environments. Strictly speaking, each new application should be subjected to the four tasks discussed to determine situation specific model validity. This, however, is impractical due to economic and temporal constraints. As a compromise a modified procedure was developed to establish the validity for individual applications. The following section describes this procedure.

firm using standard probability distributions. The second procedure approximates daily demand for the firm through the use of a single regression analysis. The third procedure approximates daily demand for the industry and firm market share through the use of regression analysis.

These three procedures were combined to yield seven different approaches to demand generation. These demand approaches were tested for accuracy under ten environmental conditions. The environmental conditions were determined by various changes in the trend, seasonality, and -variation of the demand patterns. Seventy experimental simulations runs were conducted for a test period of 200 simulated days each. The following conclusions were drawn from the research:

1. The simplest method of demand generation, the stochastic procedure, was by far the most accurate under any environmental condition where seasonality did not exist.
2. With little or no seasonlity, the stochastic procedure was superior to the firm regression and industry regression procedures. However, at high levels of seasonality, the stochastic method became less accurate than either the firm regression or industry regression procedures.
3. Comparison of the accuracy of the regression approaches developed from the firm regression and industry regression procedures revealed the level of correlation in the regression analysis had a negligible effect on the accuracy of demand generation.

A number of implications for the use of demand generation in simulation research follow from the conclusions of this research. Previous simulation research has primarily utilized the stochastic method. However, this research suggests that the stochastic procedure would be preferred only for simulations in which seasonality is either nonexistent or at a low level. If seasonal fluctuations exist which represent a significant percentage of business, a regression procedure should be utilized.

For further discussion of the research design and results see "Simulated Product Sales Forecasting-Analysis of Market Area Demand Simulation Alternatives [12]. "

2. *Forecasting Technique.* The forecasting research utilized the SPSF Testing Environment to evaluate the impacts of the two types of uncertainty while using different levels of forecasting technique sophistication. The first, demand uncertainty, deals with the rate at which a product is demanded. The second, operating uncertainty, deals with the channel's ability to replenish inventories as they are depleted. The combination of these factors affects system performance. The objective of this research was to measure the combined impacts of variations in demand and operating uncertainty on the performance of a channel system.

Measures to reduce the effects of demand and operating uncertainty are gener-

separated into forecasting and operating discrepancy. The effects of increases in demand and operating uncertainty tend to cancel each other. The total discrepancy between demand and sales is less than the sum of forecasting and operating discrepancy.

A number of observations follow from this research. First, defining forecasting error as the difference between sales and forecast is incorrect. Such a procedure generates future forecasts based upon past levels of operating as well as forecast discrepancy. Second, more consistent system performance is achieved using simple forecasting techniques. Complex techniques, although more able to track highly variable demand patterns, are also more affected by variations in operating uncertainty. Finally, the performance of the channel must be monitored and analyzed from a system's perspective to separate forecasting and operating discrepancies.

For a complete discussion of the research design and results regarding the forecasting applications, see "Simulated Product Sales Forecasting-Analysis of Forecasting Discrepancies in the Physical Distribution System [6]."

3. Inventory. Current model research is focusing upon the interaction of the physical distribution echelon structure and safety stock. In particular, the need and effectiveness of safety stock at different system locations is being evaluted under different environments of demand and lead time. The specific research questions are:

1. To determine the relative accuracy of current probabilistic techniques for determining safety stock requirements in physical distribution system;
2. To evaluate the relative impact of different levels of safety stock on the customer service levels of a multi-echeloned physical distribution system under varying conditions of demand and lead time uncertainty; and
3. To evaluate the relative impact of safety stock echelon positioning on the customer service levels of a multi-echeloned physical distribution system under varying conditions of demand and lead time uncertainty.

This research is still in progress so final results are not available.

4. Industry. Initial model research included the analysis of data provided by two firms. Their use of the model focused on the performance evaluation of alternative distribution systems and policies. The first application evaluated the distribution system of a consumer products firm while the second considered consumer durables. This application diversity provides some basis for model generalization. The model analysis for both firms involved three phases.

The first phase established the historical or fit model validation. For this phase, the model output based upon historical demand, was compared to the actual operating experience of the firm. The essential test was whether the model

simulated acceptable results when given the same environmental conditions. The model results both at a detailed and aggregate level were validated to within five percent of the actual experience of both firms.

The second analysis phase evaluated the relative model stability for each firm. As previously, model stability refers to the model's capability to adjust to initial starting conditions and to accurately simulate system performance. This analysis identifies performance differences due to policy changes with those that result from the stochastic processes of the model. The results illustrate the need to evaluate stability. The first firm realized accurate estimates of system performance within ten simulation days. The second firm, which operated under a more uncertain environment, required a forty simulation day warm-up period. Although the model did perform differently for the two firms, the consensus of both managements was that it produced credible results.

The third phase used the model to evaluate alternative distribution structures and policies. Although the firms were essentially evaluating operational alternatives in this phase, the model was still under scrutiny. The results offered a basis for comparisons of model results and management intuition. The failure to realize a reasonable match would have resulted in a decrease in model credibility. After an analysis of ten runs for each firm, management felt the results matched their expectations.

As a result of each use of the model with industry data, managers of the firms felt the SPSF Testing Environment offered both an accurate and useful tool.

B. Potential Research

Given the availability of the SPSF Testing Environment, many opportunities exist for future research and industrial application. The following examples illustrate some planned and potential research areas.

1. Analysis of System Discrepancies. As previously discussed, any discrepancy between the actual and potential levels of sales in a single period may be the result of an inaccurate forecast or the inability of the physical distribution system to suppon demand levels. The SPSF Testing Environment provides the capability to analyze the relative and absolute impact of each such discrepancy. Each type of error results from a distinct type of uncertainty. Forecast discrepancy results from uncertainty about the level of future demand. Operating discrepancy results from uncertainty relating to the performance of the distribution system. On an experimental basis, each form of discrepancy may be identified and measured to formulate improved forecasting procedures and operating policies.

2. Customer Service Standards. Research in the area of customer service deals with one of the most timely problems facing management. Customer service is

the focal point of all logistical activity. Working to achieve a given service level is difficult in itself; identifying the effective or desired service level is even more difficult. Using the SPSF Testing Environment, a controlled analysis of the relationship between levels of customer service, system sales, and total operating cost can be simulated. In addition, the impact of selected policy changes on system performance can be evaluated. For example, changes in transportation costs, inventory costs, and corresponding service levels resulting from a decrease in order cycle times may be quantified. Likewise, the response of service and cost to changes in base and/or safety inventories may be analyzed. The SPSF Testing Environment may also be adapted to test customer service policies under conditions of scarcity.

3. *Channel Cost Revenue Analysis* An additional area for research is the comparative evaluation of alternative channel designs. The structure of existing distribution systems has often evolved in response to changing conditions. The evolution has been painful economically because of the inability to create complex system designs in anticipation of such changes. The SPSF Testing Environment provides the means to reduce uncertainty accompanying any planned change. For example, the actual performance of the firm's channel system over a period of time may be compared to simulated performance of an alternative or modified structure. Modifications could be in the form of structure or operating policies. For example, the system concentration of inventories might be simulated systematically and analyzed from one echelon to another to determine the structure offering the highest degree of efficiency. On a system basis, repeated simulation may be employed to investigate the relative cost-benefit relationship of alternative systems. Once a valid replication of an actual operation is achieved, the testing environment offers a way to evaluate modified distribution structures and/or policies.

4. *Market Share Analysis.* An interesting area of potential research is analysis of the effect of various marketing strategies on corporate market share. Procedure Four of the Demand Module incorporates a model developed by Kotler to estimate a firm's market share. Such marketing strategy inputs as price, product quality index, customer service, and level of promotional expenditures for the firm and the competition can be included in this model. These inputs can be analyzed against market share over time via regression analysis to estimate and forecast market share. Further, through a log transformation of the data and further regression analysis, the elasticities of each of the marketing strategy inputs can be estimated. Thus, the potential exists not only for estimating market share, but for estimating the degree to which market share will fluctuate with any change in marketing strategy.

5. *Contingency Planning.* A final broad area for potential research is contingency planning and evaluation. The response of an operating system to en-

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